Tilting the wrong firms?
Sustainable investing in transitioning firms*

Dennis Bams [a,b], Bram van der Kroft [c]

[a]Maastricht University

[b]Open University

[c]Massachusetts Institute of Technology

February 27, 2026

Abstract

Socially responsible investors increasingly rely on portfolio tilting to curb social and environmental externalities, yet evidence on its effectiveness remains mixed. We show that this ambiguity reflects the distinction between *extensive-margin* and *intensive-margin* tilting. While prior work emphasizes reallocations toward already sustainable firms, we document that many investors instead tilt toward firms in transition, targeting improvements in sustainable performance rather than scale. Using a new method that separates firms' sustainability aspirations from realized performance for 9,130 firms across 77 countries, we show that such intensive-margin tilts lower transitioning firms' cost of equity, accelerate sustainable investment and innovation, and lead to long-run improvements in outcomes. Portfolio tilting can therefore play a constructive role when aimed at firms' intensive margin of sustainability.

Key words: Portfolio tilting, Environmental, Social, Governance (ESG) ratings, Sustainable Aspirations vs Performance

JEL codes: G11, M14, Q56

*Contact information: bramvdk@mit.edu; w.bams@maastrichtuniversity.nl. We thank Rob Bauer, Florian Berg, Martijn Boermans, Jaap Bos, Natalya Bikmetova, Marco Ceccarelli, Kevin Chuah, Jeroen Derwall, Alex Edmans, Piet Eichholtz, Peter Fiechter, Philip Fliers, Anand Goel, Andreas Hoepner, Vaibhav Keshav, Stefanie Kleimeier, Julian Kölbel, Thomas Post, Roberto Rigobon, Jan Schneemeier, Kelly Shue, and David Skandera, as well as seminar participants at Massachusetts Institute of Technology, Stevens Institute of Technology, ISC Paris, Twente University, Maastricht University, and Open University. We also thank the organizers of the American Economic Association, Financial Management Association, European Economic Association, Academy of Management Annual Meeting, GRASFI Annual Meeting, GRONEN Annual Meeting, JMS Annual Meeting, World Finance Conference, Marketing Finance Conference, Portuguese Finance Conference, Corporate Governance and Risk Management in Financial Institutions conference.

1 Introduction

Socially responsible investors seek to reduce social and environmental externalities through portfolio choice. Portfolio tilting is a key tool investors use to pursue this goal. Tilting is generally interpreted as investors partially shifting portfolios from higher- to lower-externality firms. These tilts aim to improve firms' environmental and social (hereafter, sustainable) performance at the *extensive margin*: enabling already sustainable firms to grow more quickly by reducing their capital costs. Yet recent evidence questions whether investors can meaningfully expand the scope of sustainable firms through capital costs (Berk and Van Binsbergen, 2025), and making green firms larger does not always guarantee lower aggregate emissions (Hartzmark and Shue, 2025). What then is the role of portfolio tilting, and how can investors curb externalities through portfolio choice?

We address this question by proposing an alternative portfolio tilting strategy that focuses on the *intensive margin* of sustainable performance. Here, investors allocate capital to firms that are not yet sustainable but are beginning to transition their operations in a sustainable manner. Their aim in targeting such transition-phase firms is to make less sustainable firms more sustainable rather than to expand their scope as with extensive-margin tilts.[1] The mechanism by which intensive margin tilts can improve sustainable performance revolves around investors preserving control rights. Alongside financing through a potential cost-of-capital channel, investors can exercise "voice" and steer firms toward sustainability under a credible threat of exit. In this paper, we document that many socially responsible investors tilt toward transition-phase firms and examine whether intensive-margin tilts improve firms' sustainable performance.

Let us be more precise about what we mean by a firm's sustainable transition phase. We define a sustainable transition phase as the period in which firms progress from disclosing sustainability information to adopting policies, setting targets, and implementing protocols, ultimately improving outcomes and reducing controversies. Early in this phase, aspirations expressed through reporting and policy commitments outweigh performance changes in outcomes and controversies. As the transition advances, these aspirations will increasingly translate into

[1] Such tilts inherently require a long-term perspective, as firms must either develop new technologies or wait for existing assets to depreciate before adopting sustainable alternatives (Cooper and Haltiwanger, 2006; Cohen et al., 2020a; van der Kroft et al., 2025).

sustainable performance improvements. For example, an initial policy on employee health and safety may later be complemented by protocols, such as dedicated safety teams or training programs, and eventually by measurable outcomes, such as reduced workplace accidents.

We develop a new method to assess firms' trajectories in their sustainable transition phase. Conventional measures of sustainable performance, such as CO_2 emissions or ESG ratings, do not distinguish between sustainable aspirations and performance. We need this distinction to uncover firms' positions in their sustainable transition phases. We therefore create a method that non-parametrically ranks sustainable aspirations and performance separately.

We do so by using over 150 granular firm-level ESG metrics covering 9,130 firms across 77 countries from 2003 to 2022 from the London Stock Exchange Group (LSEG).[2] We aggregate reporting, policies, protocols, and targets information into sustainable aspiration scores, and sustainable outcomes and controversies into sustainable performance scores. The granularity of our data allows us to study sustainability in general and across 14 more detailed environmental and social dimensions.[3] We validate our scores using established measures of pollution from the Environmental Protection Agency's (EPA) Toxic Release Inventory (TRI), ECHO environmental fines, and P2 pollution prevention datasets.

We show that many socially responsible investors actively tilt their portfolios on the intensive margin. We follow Gibson Brandon et al. (2022) and classify investors as sustainable if they signed the United Nations Principles for Responsible Investment (UN-PRI) treaty. Measuring sustainability preferences without surveying investors is inherently difficult. Accordingly, PRI signatory status provides a transparent and widely used alternative (Dimson et al., 2023).[4] We capture tilting from the perspective of the firm and compute it as the share of

[2]LSEG ESG data (formerly Refinitiv ESG and Asset4) has been extensively used in sustainable finance literature such as Liang and Renneboog (2017), Dyck et al. (2019), and Hsu et al. (2023). Its *granular* information has always been accessible to investors through public sources and is, therefore, unaffected by alterations in the ESG rating methodology of LSEG (Berg et al., 2020). Since any aggregation of data requires judgment calls, we elaborate on our choices in the data section and in Appendices B to D.

[3]These include green investments, greenhouse gas emissions, materials source management, supply chain management, water use, business ethics, customer welfare, legal and regulatory concerns, labor practices, waste management, privacy, selling practices, employee health & safety, and employee management.

[4]At the same time, prior work raises questions about how consistently signatories tilt their portfolio holdings toward sustainable firms (Kim and Yoon, 2023). This does not necessarily imply a lack of commitment: signatories may pursue intensive rather than extensive-margin portfolio tilting. If anything, misclassifications of investors would create noise, reducing the likelihood of observing tilting with subsequent sustainable performance improvements. Taken together, these considerations motivate our use of PRI signatory status as an indicator of sustainable investors. We are open to using alternative proxies.

UN-PRI ownership relative to total institutional ownership reported in Thomson Reuters 13F filings.

On average, we find that when firms increase their sustainable aspirations by one standard deviation, sustainable investors tilt their portfolios toward these firms and increase holdings by 4.54 percent. In contrast, their allocations do not respond to changes in sustainable performance. These portfolio reallocations are not explained by investors' filing of and voting on environmental and social shareholder proposals. Accordingly, the tilting pattern of investors aligns with our definition of transitioning firms, suggesting that investors also tilt at the intensive-margin.

How do sustainable investors tilt transitioning firms, given that detecting them is challenging? One possibility is that investors generate costly information to tilt them. This is not unthinkable given the higher fees associated with actively managed sustainability funds (Engler et al., 2025). Another is that investors rely on third-party ESG ratings, effectively outsourcing part of their judgment (Hartzmark and Sussman, 2019). We examine the latter with ratings from MSCI, Sustainalytics, S&P Trucost, and FTSE. We find that these ratings correlate strongly with firms' aspiration scores and show only a weak relationship with performance scores, a pattern consistent with the intensive-margin tilting we document. While private information creation remains a viable channel that can account for the tilts we observe, we argue that at least some are attributable to investors directly constructing portfolios based on ESG ratings.

We study whether firms progress through their sustainable transition phase in three steps: the effect on firms' capital costs, the initiation of new sustainability goals and green investments, and the eventual realization of these goals. We do so specifically for the sub-sample of firms that are sustainably transitioning their operations: those in the top 20% to 80% of sustainable performance and those in the bottom 20% of sustainable performance but above the bottom 20% sustainable aspirations.[5] These firms are distinct from already sustainable (those in the top 20% of sustainable performance) and unsustainable firms not in transition (those in the bottom 20% of sustainable performance and sustainable aspirations).

First, we show that intensive-margin tilting is associated with reductions in the cost of eq-

[5]Findings are robust when we take different cut-off points.

uity for transitioning firms. We measure the cost of equity using the average of Gebhardt et al. (2001), Hou et al. (2012), and Chattopadhyay et al. (2022) estimates.[6] Using lagged ownership to mitigate contemporaneous sorting concerns, we find that higher socially responsible ownership predicts lower subsequent firm-level costs of equity after controlling for firm and year fixed effects. Economically, a one-standard-deviation increase in socially responsible ownership is associated with a 27.3 basis points decline (or 0.12 standard deviations) in the cost of equity. This equity-market effect does not carry over to firms' borrowing costs, reinforcing the view that the decline in capital costs is driven by portfolio tilts.

In contrast, we find that already sustainable firms do not experience reductions in capital costs under extensive-margin portfolio tilts. This persistence in capital costs reflects an in-equilibrium Pástor et al. (2022) setting, as these firms have already transitioned their operations and lowered their capital costs along this trajectory by receiving additional sustainable investor inflows. Therefore, capital costs are already at a lower equilibrium level, and we should not expect new capital cost effects from an extensive-margin tilting perspective if sustainable performance remains constant. Conversely, transitioning firms should attract more extensive-margin tilts and reduce capital costs, as they continue to improve their sustainable performance through intensive-margin tilting.

Second, intensive-margin portfolio tilting is associated with transitioning firms accelerating their sustainability transitions. After socially responsible investors tilt toward transitioning firms, these firms adopt more ambitious sustainability aspirations across multiple ESG dimensions. This indicates a commitment to greater sustainability. We further assess the credibility of these commitments by examining firms' green innovation, a costly signal of sustainable improvement. We collect patents from the U.S. patent registry and classify them according to the OECD guidelines for sustainable patents (using the approach of Cohen et al., 2020b). We find that firms exhibit stronger sustainable innovation post-tilt: greater total patenting activity, patenting citations, and more climate-change-mitigation patents. Together, these findings reflect credible investments in sustainability by transitioning firms. Conversely, we do not observe such investments in firms that are not in transition, i.e. those already sustainable

[6] We choose these measures as Lee et al. (2021) denotes them as the most accurate among 95 alternative models.

or unsustainable and not in transition, when they receive sustainable investor inflows. This reemphasizes the distinction between intensive-margin portfolio tilting to improve sustainable performance and extensive-margin tilts that focus on size.

Third, firms that experience intensive-margin tilting are more likely to materialize their sustainable aspirations over time. We regress firms' past 15 years of sustainability aspirations on current sustainable performance across matched ESG dimensions. At the aggregate level, higher aspirations predict subsequent improvements in sustainable performance. This follow-through is especially pronounced in areas that attract strong investor attention, such as greenhouse gas emissions and biodiversity (Krueger et al., 2020; Giglio et al., 2024). Within these domains, firms advance more quickly on goals that require less time to implement. For example, firms realize aspirations related to green investments roughly three times faster than they achieve emissions-reduction targets, reflecting the inherently longer horizon of emissions abatement. Likewise, firms are more likely to fulfill aspirations to switch to suppliers that are already sustainable than to require existing suppliers to become more sustainable, which takes more time.

Our findings indicate genuine improvements in sustainability rather than greenwashing—the practice of presenting a firm as more sustainable than it truly is. Firms elevate their sustainability aspirations *after* socially responsible investors tilt toward them. This contrasts a greenwashing narrative in which they make empty environmental or social claims to attract investors *before* they tilt. Firms also issue credible and costly signals of real behavioral change, most notably through increased sustainable innovation. Further, the effects of intensive-margin portfolio tilting are most potent among transitioning firms operating in sectors where sustainability pressures are particularly acute and where greenwashing would appear most plausible. Moreover, firms make the most significant progress on their stated aspirations precisely in ESG dimensions that face the strongest investor scrutiny. Taken together, our results show that intensive-margin portfolio tilting occurs meaningfully in practice and can play a constructive role in sustainably transitioning the operations of less sustainable firms.

Our paper makes three contributions. First, we advance the literature on portfolio tilting and sustainable finance by distinguishing between extensive and intensive margin tilts. Recent

empirical literature questions whether portfolio tilting can improve sustainable performance (Berk and Van Binsbergen, 2025). They test the efficacy of tilting by focusing on investors reallocating capital to sustainable firms (Hartzmark and Sussman, 2019; Gibson Brandon et al., 2022; Kim and Yoon, 2023; Pástor et al., 2025) and examining improvements in sustainable performance among tilted firms (Dyck et al., 2019; Gantchev et al., 2022). Distinguishing between extensive and intensive margin tilting is critical to this debate, as it shapes whether socially responsible investors tilt toward sustainable firms and whether such tilts are intended to improve firms' scale or sustainable performance. This distinction helps reconcile prior findings that portray portfolio tilting as less effective. For example, Heath et al. (2023) argues that tilts generate limited improvements in sustainability, and Raghunandan and Rajgopal (2022) reports that sustainable investors tilt toward less sustainable firms.[7] These patterns do not necessitate a failure of tilting itself; they align with different tilting strategies. Given growing critiques of extensive-margin tilting, tilts that focus on the intensive margin of sustainable performance offer a more effective alternative for portfolio choice.

Second, we contribute to the literature on ESG disclosure and sustainable performance measurement. Unlike financial reporting, ESG disclosure lacks consistent guidelines, which creates information asymmetries and complicates assessments of sustainability performance (Christensen et al., 2021; Lin et al., 2024; Gipper et al., 2025). Attaining high-quality ESG information is important as it shapes market outcomes (Christensen, 2016; Ahn et al., 2024; Krueger et al., 2024) and can deter greenwashing by making overstated claims easier to detect (see Darendeli et al., 2022; Dechow, 2023; Frankel et al., 2025; Xue, 2025, on greenwashing). We contribute methodologically by addressing some of these measurement challenges and develop a non-parametric approach that separately measures firms' sustainable aspirations and performance. We perform this decomposition in the aggregate and at a granular level across green investments, greenhouse gas emissions, materials sourcing, supply chain management,

[7] Raghunandan and Rajgopal (2022) also document limited short-term sustainable performance improvements associated with tilting. Although their results may appear to suggest that intensive margin tilts are ineffective, the key nuance concerns the time horizon. We similarly find modest short-term improvements, yet we argue and document that intensive margin tilts require a longer horizon to manifest their full effect. Sustainable operational transitions often unfold over several years due to capital adjustment costs and innovation cycles. Consistent with this mechanism, we show that intensive margin portfolio tilting yields substantial improvements in sustainability performance in the long run.

water use, business ethics, customer welfare, legal and regulatory issues, labor practices, waste management, data privacy, selling practices, employee health and safety, and employee management in a global sample. The approach complements common proxies, such as ESG ratings that blend aspirations and performance, or CO_2 emissions and targets that capture only one ESG dimension. The improved measurement precision enables scholars to identify sustainable firms more accurately and analyze whether firms follow through on their stated goals (Raghunandan and Rajgopal, 2022; Cohen et al., 2023; Reitmaier et al., 2024). To support such work, we open-source our aspiration and performance scores.[8]

Last, we contribute to a deeper understanding of what ESG ratings measure. Prior work documents large differences across ESG ratings, driven by variation in measurement, scope, and weighting of sustainability indicators (Berg et al., 2022), divergent definitions of ESG (Chatterji et al., 2016), conflicts of interest with credit rating agencies (Li et al., 2024), and how agencies treat missing ESG information (Christensen et al., 2022). We extend this literature by examining the *content* of ESG ratings. We show that ratings primarily reflect firms' sustainability aspirations rather than their sustainability performance. This forward-looking perspective matters for inference. Studies that treat ESG ratings as performance measures may instead capture firms in the early stages of a sustainability transition phase, which has a different interpretation. In practice, recognizing that ESG ratings primarily reflect aspirations rather than performance enables investors to better align portfolios with non-pecuniary sustainable investment preferences (Riedl and Smeets, 2017; Bauer et al., 2021; Bonnefon et al., 2025).

2 Data

We segregate firms' sustainable aspirations from their sustainable performance using granular LSEG ESG information. This database contains 466 ESG variables for a worldwide sample of 9,130 listed non-financial companies from 2003 to 2022, with 67,258 firm-year observations. The broad scope of granular ESG information in LSEG enables us to compare similar aspects of sustainable performance within firms. We categorize each variable as ESG reporting, policy, protocol, target, output, or controversy (see Table 1).

[8] See `https://www.bramvanderkroft.com/data`.

Our sample covers an average yearly combined market capitalization of 28.6 trillion USD. It captures firms in non-financial industries, such as mining, construction, generic manufacturing, utilities, retail & wholesale, service, health care, ICT, food & beverages, and petrochemical manufacturing. We removed financial institutions for data relevance as their sustainable performance is linked to their holdings rather than their direct operations. We cover an international sample of which 3,341 firms are domiciled in Asia, 2,968 in North America, 1,874 in Europe, 373 in Oceania, and 574 in Latin America, the Middle East, or Africa. We also collect MSCI IVA, FTSE, S&P, and Sustainalytics industry-adjusted ESG ratings; firm characteristics and accounting information from Compustat US and Compustat Global; stock price information from CRSP and Compustat Global; bond yields from the WRDS bonds dataset; and institutional ownership information from Thomson Reuters 13F filings.[9]

LSEG ESG data is extensively used in sustainable finance (Liang and Renneboog, 2017; Dyck et al., 2019; Hsu et al., 2023). Where the literature often employs ESG ratings, we dive one level deeper and rely on the granular ESG information underlying these ratings to separate firms' sustainable aspirations from their sustainable performance. LSEG collects this information from sustainability reports, NGO communications, government datasets, and news coverage.

Since LSEG collects this information in a non-standardized way, we perform several data-cleaning steps. For brevity, we report below the steps relevant to empirical interpretation and refer the reader to Online Appendix A, where we provide a variable-by-variable data cleaning manual. First, LSEG reports multiple variables that capture similar aspects of ESG (for instance, energy use and energy use intensity). We re-scale and aggregate such variables. Second, LSEG captures some ESG aspects only for a limited number of firm-year observations. Due to poor data coverage and a narrow scope, we removed variables with fewer than 50 firm-year observations. Last, we adjust most continuous granular ESG variables for firm size. Many facets of sustainable performance scale directly with production (e.g., natural resource use, employee accidents, and energy use), necessitating size adjustments to fairly compare sustainable

[9]MSCI IVA, FTSE, and S&P ratings are converted to a 0 to 10 scale for which 10 represents AAA, the best possible score, and 0 CCC, the worst possible score. Like the other ratings, we convert Sustainalytic's risk rating as 10 when the firm has no ESG-related risks and 0 when it has the most extensive ESG risks. MSCI IVA ESG ratings are distinct from KLD's strengths and weaknesses, which were discontinued in 2014.

performance across firms with different production scales. See Table 1 for the exact variable list. LSEG itself performs near-identical data cleaning steps when creating its ESG scores as it retains at most 177 granular ESG variables per industry, closely resembling our 169 variables.[10]

3 Method

3.1 Segregating sustainable aspirations from performance

Studying whether intensive-margin portfolio tilting enables firms to transition their operations sustainably requires accurate measures of firms' sustainable aspirations and performance. However, we are unaware of any existing method that enables a holistic assessment of this. Therefore, we construct a novel method to measure firms' sustainable aspirations and performance relative to industry peers using granular ESG information.

Operationalizing granular ESG information to measure firms' sustainable transition phases is not trivial. A simple analysis regressing more than 100 granular ESG aspects on the share of sustainable investors is infeasible due to the multiple-regressor problem, the reduced sample size resulting from missing observations, and the implicit assumption that all ESG information is material across industries. For these reasons, we require a more nuanced approach to dimensionality reduction of granular ESG data.

We start by segregating granular ESG information into sustainable aspirations and performance. We distinguish sustainable performance from aspirations by analyzing whether ESG variables, in and of themselves (i.e., directly), affect sustainable performance, or whether they can indirectly improve it when adopted. To illustrate, emission policies are part of aspirations as the policy in and of itself does not improve firms' sustainable performance but has the potential to do so moving forward. In contrast, firms' actual emissions are part of sustainable performance because they directly affect the environment.

[10] See `https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/ESG-scores-methodology.pdf`. Online Appendix B rules out potential back-filing concerns in LSEG ESG data as discussed in Berg et al. (2020). Correcting for revenue instead of total assets yields similar results. Further, we explicitly correct for size in all upcoming regression analyses to address any residual size-driven effects on ESG ratings. We correct for a potential extrapolations of CO_2 data by industry and firm size in Appendix E (see Aswani et al., 2024).

The distinction between aspirations and performance is not always straightforward, necessitating careful consideration of all variables. For instance, whether a firm participates in an emissions trading scheme could, at first glance, be seen as an outcome measure, as such schemes are known to reduce emissions (Colmer et al., 2024). Conversely, we classify the protocol as an aspiration because being in an emission trading scheme is often legally enforced and will not directly reduce emissions but could indirectly reduce emissions by increasing future pollution costs. Access to direct output measures allows us to treat protocols as aspirations rather than as proxies for performance.

Using this distinction and the classification of ESG variables inherent to LSEG, we assign firms' ESG reporting, policies, protocols, and targets to sustainable aspirations, and their ESG outputs and controversies to sustainable performance. Reporting variables capture whether and to what extent firms report on their sustainable aspirations and performance. In these reports, firms promise future improvements in sustainable performance by upholding ESG policies and protocols. Policies and protocols sometimes accompany targets that explicate future aspirations for sustainable performance improvements. We argue that these ESG reporting, policies, protocols, and targets constitute only part of firms' sustainable aspirations as they are often relatively easy to implement and have a limited direct impact, in and of themselves, on sustainable performance.[11] In contrast, we classify ESG output and controversy variables as sustainable performance because they directly increase and reduce firms' environmental and social impact, respectively. Appendix A briefly describes how we assign each granular ESG aspect to one of these categories.

3.2 Estimating sustainable aspirations and performance scores

We aggregate sustainable aspiration and performance information using a nonparametric rank-ordering method. Estimating firms' sustainable aspirations and performance in a parametric manner, such as by taking a weighted average, requires normative assessments of the relative

[11] We classify ESG protocols as aspirations because they often reflect whether or not firms perform certain protocols closely resembling policies. For example, a dummy indicating whether firms have waste-reduction initiatives more closely resembles an ESG policy than their actual waste ratio to total assets. Similarly, whether firms have health safety training and the size-adjusted injury rate or whether firms have environmental investment initiatives and how much they invest.

importance of each ESG variable. Are CO_2 emissions more or less meaningful than providing employees a living wage, aspirations on water use more promising than aspirations on privacy, or human rights controversies more impactful than providing products at a discount to developing countries? These trade-offs cannot be answered objectively, yet they play a prominent role in assessing sustainable performance. To address this concern, we adopt a nonparametric rank-ordering approach to aggregate sustainable aspirations and performance variables into overall scores based on weak dominance (building on Wittkowski et al., 2004).

The method works as follows. First, we perform pairwise firm-by-firm comparisons of granular ESG variables for sustainable aspirations and performance, separately. We conduct this comparison using weak dominance. To elaborate, while we cannot compare the relative performance of low-emission firms with firms with good labor conditions, we can argue that a firm with lower emissions and better labor conditions is more sustainable than either. More formally, in Equation 1, we argue that firm f has superior sustainable performance to firm $f^{'}$ when it performs at least equally well on each ESG variable x_i that jointly span the set of sustainable performance indicators X and performs strictly better on one of these variables.

$$ESG_f > ESG_{f'} \iff \forall x \in X : \mathrm{ESG}_f(x_i) \geq \mathrm{ESG}_{f'}(x_i) \wedge \exists x_i \in X : \mathrm{ESG}_f(x_i) > \mathrm{ESG}_{f'}(x_i) \quad (1)$$

$$Rank(ESG_f) = \sum_{f'} I(ESG_f > ESG_{f'}) - \sum_{f'} I(ESG_f < ESG_{f'}) \quad (2)$$

We account for variable selection sensitivity. Nonparametric methods tend to amplify the influence of unrepresentative outliers. To keep comparisons aligned with firms' overall sustainability profiles, we rank aspiration and performance variables for variables classified as material by the Sustainability Accounting Standards Board (SASB). SASB has been widely used by scholars and regulators (Khan et al., 2016). Although SASB does not predict financial performance (Ahn et al., 2024), the classification maps ESG areas critical for sustainable performance, such as emissions and water use in mining companies and business ethics in financial services. Accordingly, we compare firms' sustainable aspirations and performance in Equation 1 using only SASB-material ESG variables, which concentrates measurement on high-impact aspects and supports consistent inference even when firms emphasize select material issues

rather than spreading effort across immaterial ones (a pattern depicted in Wu et al., 2020).[12]

Next, we extend this pairwise comparison of sustainable aspirations and performance into relative performance scores across firms. In Equation 2, we use the relative pairwise performance of Equation 1 to construct firm-specific scores by adding the number of firms for which it is weakly dominant in its industry and subtracting the number of firms compared to which it is weakly dominated. We separately estimate such scores for sustainable aspirations and performance in general, sustainable aspirations and performance by SASB category, and ESG reporting, policies, protocols, targets, outcomes, and controversies.[13] We report all scores on a scale from 0 (inferior) to 10 (superior) to match the scale of ESG ratings.

3.3 Validating sustainable aspiration and performance scores

We conduct several internal and external robustness checks to validate the accuracy of our sustainable aspiration and performance scores. To assess external validity, we benchmark sustainable aspiration and performance scores against data from the US Environmental Protection Agency (EPA). The EPA closely monitors environmental pollution from US heavy manufacturing firms, and its data have been extensively used and validated in prior literature.[14] We collect information from the EPA on firms' pollution prevention activities (P2), toxic releases (TRI), and environmental fines (ECHO), respectively, reflecting sustainable aspirations, outputs, and controversies. For our scores to be externally valid, we expect our sustainable aspiration scores to be positively associated with EPA pollution-prevention activities, and our sustainable performance scores to be negatively associated with firms' toxic releases and environmental fines

[12]Even though selecting relevant variables is theoretically vital in non-parametric rank-ordering methods, we show that our results persist without exclusively using SASB material ESG variables. This is because the underlying data-generating process of aspirations is driven by whether firms provide sustainability reports in which they report on a wide range of ESG aspects, imposing positive correlations between firms reporting on multiple aspects of ESG.

[13]Specifically, we estimate SASB-specific scores where we have granular ESG information available for both sustainable aspiration and performance. We do so for the categories of materials source management, supply chain management, business ethics, customer welfare, legal and regulatory concerns, labor practices, water use, waste management, privacy, business model resilience, greenhouse gas emissions, selling practices, employee health safety, and employee management. The Wittkowski et al. (2004) rank-ordering algorithm is asymptotically normally distributed, enabling us to treat sustainable aspiration and performance scores as continuous variables in regression analyses. We validate this in Online Appendix C.

[14]See Shapiro and Walker (2018); Xu and Kim (2021); Dasgupta et al. (2023); Hsu et al. (2023). Due to its narrow scope (US (petro)chemical and manufacturing firms), we cannot rely solely on EPA data as the primary data source in this paper. This especially as portfolio tilting occurs over the entire global equity portfolios of institutional investors, introducing a selection bias toward firms in a very early stage of their sustainable transition.

(controversies).

Table 2 analyses how our sustainable aspiration and performance scores are associated with the environmental aspirations and performance of US heavy manufacturing firms covered by the EPA. Columns (1) to (2) regress sustainable aspirations and performance scores on the natural logarithm of pollution prevention activities undertaken by heavy US polluters while correcting for plant times chemical and chemical times time fixed effects and plant-chemical clustered standard errors (in line with Akey and Appel, 2019; Naaraayanan et al., 2021). We find that our sustainable aspiration scores are positively associated with pollution-prevention activities. In contrast, our sustainable performance scores, which should not reflect firms' aspirations, are not associated with pollution prevention activities. This provides initial evidence on the validity of our scores.

In addition to pollution prevention, we similarly assess the relationship between sustainable aspiration and performance scores and two measures of firms' production-adjusted toxic releases in Columns (3) to (6).[15] For both revenue and cost of goods sold intensities, sustainable performance scores decline when firms pollute more, while sustainable aspiration scores are unrelated to toxic releases. This negative relationship is warranted as higher pollution should indicate lower sustainable performance and, hence, a lower score.

As a last external validation analysis, we consider how a firm's sustainable aspiration and performance scores relate to environmental fines. As environmental fines reflect either controversies or uncovered lower sustainable performance, we expect sustainable performance scores to be lower for firms with more frequent or sizeable fines. Accordingly, we find that both the number and log of the amount of EPA penalties are negatively associated with firms' sustainable performance scores in Columns (8) and (10).

The relationship between sustainable aspirations and environmental fines is less trivial. On the one hand, environmental fines are a performance measure that should not be directly related to aspirations. However, firms might initiate new aspirations following large penalties as the literature shows this can reduce legal fines in common law countries (Godfrey, 2005). In spirit with this thought, we find no significant effect on the number of environmental penalties (Col-

[15]We follow Akey and Appel (2019) in correcting for firm size by dividing firms' toxic releases with both revenue and cost of goods sold separately.

umn 7) but a positive impact on the penalty amount (Column 9). This suggests that firms try to dampen the negative impact of larger ESG controversies by initiating sustainable aspiration campaigns. The results presented above using established external datasets lend credibility to our sustainable aspirations and performance measures.

Sustainable aspiration and performance scores are also internally consistent. We analyze the degree to which ESG ratings reflect sustainable performance or aspirations using several granular ESG variables critical to firms' sustainable performance in the following section, namely CO_2 emissions, water use, human rights, and employee health & safety (building on Liang and Renneboog, 2017; Blakeslee et al., 2020; Bolton and Kacperczyk, 2023). Further, we perform several analyses in Online Appendix C indicating that sustainable aspiration and performance scores strongly correlate with their underlying granular ESG information. This association is a necessary condition when aggregating multiple variables. Additionally, the Appendix shows that granular ESG variables are more strongly related to their respective ESG sub-scores than sustainable aspiration or performance scores. To illustrate, the correlation between human rights policies and the policy sub-score is higher than with human rights policies and the overarching sustainable aspirations scores, which also capture reporting, protocols, and targets. Therefore, we argue that our sustainable aspiration and performance scores capture firms' sustainable aspirations and performance with reasonable precision.

4 Results

4.1 Intensive-margin portfolio tilting

4.1.1 Which firms do sustainable investors tilt?

We analyze the extent to which sustainable investors tilt toward transitioning firms. Because assessing firms' sustainable performance from raw data is complex and time-consuming, investors often tilt their portfolios using ESG ratings (Hartzmark and Sussman, 2019). For this reason, we take them as a starting point in investigating which firms investors tilt.

We classify sustainable investors by their compliance with the United Nations Principles

of Responsible Investing (UN-PRI) signatory. In April 2006, the United Nations launched the Principles for Responsible Investment (UN PRI), an initiative to encourage investors to manage their assets sustainably. Signing this treaty provides a credible and costly signal that investors are willing to invest sustainably. Therefore, UN PRI signatories are a widely used classification of sustainable investors (Ceccarelli et al., 2021; Gibson Brandon et al., 2022).[16]

We analyze which firms sustainable investors tilt toward by computing the share of sustainable-investor ownership at the firm level. Our paper focuses on the consequences of portfolio tilting on the firm, either by making it more sustainable (intensive-margin) or making sustainable firms grow more quickly (extensive-margin). For this reason, we adopt a firm-level definition of portfolio tilts to examine the consequences of firms experiencing an inflow of sustainable investors, rather than why certain sustainable investors tilt their portfolios. In a sense, studying the cross-sectional variation in sustainable investor holdings at the firm level aggregates individual sustainable investor decisions and provides an aggregate measure of tilts. As such, if a firm with higher sustainable performance attracts more sustainable investors, then the average tilt of sustainable investors is at the extensive margin. Moreover, higher ownership in firms in their sustainable transition phase, those with low sustainable performance and ample aspirations, would indicate an intensive-margin tilt.

We construct this measure using Thomson Reuters 13F holdings data. We start by merging 13F filing data with PRI signatory information via fuzzy name matching. Subsequently, we compute the percentage of stocks in individual firms held by institutional investors, conventional (non-PRI) investors, and multiple types of PRI investors. This enables us to directly assess whether sustainable investors tilt their portfolios more strongly toward highly ESG-rated firms, firms with ample sustainable aspirations, or firms with superior sustainable performance

[16]See `https://www.unpri.org/signatories/signatory-resources/signatory-directory` for further details. Signing the treaty requires investors to 1) implement sustainable investment guidelines that describe how the investors will adopt ESG issues in their investment mandate, covering at least 50% of assets under management, 2) hire at least one full-time employee to implement these sustainable investment guidelines, and 3) report their sustainable investment guidelines to fellow members. However, some prior work suggests that signatories do not consistently tilt their portfolios toward sustainable firms (Kim and Yoon, 2023). This pattern need not reflect weak commitment. Instead, signatories may emphasize intensive strategies, engaging more deeply with a smaller set of holdings, rather than extensive-margin tilting across the full portfolio. If some investors are misclassified, that error should attenuate our estimates by adding noise and making it harder to detect any tilting and the subsequent improvements in firms' sustainability performance. These considerations motivate our use of PRI signatory status as a practical indicator of sustainable investors.

than conventional investors.

As a first step, we validate that sustainable investors tilt their portfolios toward highly ESG-rated firms. In Table 3 Panel A, we regress the average of MSCI IVA, FTSE, S&P, and Sustainalytics ESG ratings and sustainable aspiration and performance scores on the percentage of stocks owned by institutional investors, conventional investors, PRI investors, PRI asset owners, and PRI investment managers at the firm-level.[17] All specifications correct for firm size, time, and firm fixed effects. In Column (1) of Panel A, we find that institutional investors' holdings increase with the ESG ratings of firms. Columns (2) and (3) split this effect across PRI and conventional investors. Sustainable investors tilt their portfolios toward firms with higher ESG ratings, acquiring 0.61% of the firms' equity when ESG ratings increase by one standard deviation, see Column (2). This effect is economically significant and reflects a 4.03% of their average holdings.[18] By contrast, the economic impact of a similar increase in ESG ratings is substantively smaller for conventional investors who only acquire 0.77% of their average holdings, indicating that sustainable investors tilt portfolios more strongly to highly ESG-rated firms.

We find that ESG-rating-based tilts align with intensive-margin tilting, not extensive-margin tilting, leading to a reallocation toward transitioning firms. Our separation of sustainable aspirations and performance enables us to determine whether sustainable investors tilt toward already sustainable, transitioning, or unsustainable firms. We empirically verify which firms investors tilt in Columns (6) to (8) by analyzing whether institutional, PRI, and conventional investors tilt firms with high sustainable aspiration and performance scores. In economic terms, PRI investors increase their portfolios by 0.69 percentage points in the market capitalization of firms for a one standard deviation increase in sustainable aspirations, reflecting a 4.54% increase in holdings, see Column (7). Conversely, sustainable investors appear unaffected by firms' sustainable performance. This portfolio allocation by sustainable investors to firms with

[17] We purposefully do not include Refinitiv ESG ratings due to a backfilling bias to match financial performance (Berg et al., 2020).

[18] We compute this and all upcoming economic magnitudes in the following manner: First, we compute the effect of a one standard deviation increase in ESG ratings, sustainable aspirations, and sustainable performance on portfolio holdings in percentage point terms. We do so by multiplying the respective coefficient estimates with the unit increase reflecting a one standard deviation increase in ESG ratings, sustainable aspirations, and sustainable performance, respectively 2.08, 1.78, and 1.44. Subsequently, we divide this number by the average portfolio weight of the respective investor group, as reflected in Table 3. This gives us $\frac{0.293*2.08}{15.13} = 4.03\%$ for Column (2).

high sustainable aspirations is unlikely to be random, as conventional investors are unaffected by sustainable aspirations or performance (see Column 8).

Intensive-margin portfolio tilts to transitioning firms are unaffected by the filing of or voting on shareholder proposals. From a classical exit–voice perspective, these strategies are intertwined. Investors may tilt for its own sake, while also attaining greater leverage in engaging with firms or filing shareholder proposals (Hirschman, 1972; McCahery et al., 2016; Broccardo et al., 2022). Accordingly, what we observe as sustainable investors tilting toward not-yet-sustainable firms could potentially be a first stage in "voice". Conversely, we find that the tendency of sustainable investors to hold firms with ample sustainable aspirations is unaffected by shareholder proposal outcomes or voting. Using ISS shareholder Proposals data for S&P 1500 firms following He et al. (2023) in Table 3 Panel B, we find that filing proposals does not affect investors' tendency to tilt to transitioning firms. Further, we find no significant difference in Panel C where we instead use the share of votes supporting environmental and social proposals rather than successful votes.[19]

In addition to public engagement, investors may also engage privately with firms through direct negotiations with management. Although such engagements are unobservable, we provide indirect evidence on their consequences. Investors differ in their incentives to incur costs to identify engagement targets, produce firm-level sustainability information, and perform sustained monitoring. While the costs are roughly similar across investors, the benefits differ substantially. Universal asset owners internalize a larger share of economy-wide environmental and social risks, giving them stronger incentives to invest in information creation and private engagement (Ilhan et al., 2023) compared to investment managers who pass risks to clients (Liang et al., 2022), incur flow-sensitive engagement costs (Ivković and Weisbenner, 2009), and rely more heavily on portfolio tilting than engagement (Bebchuk et al., 2017). As a result, investors with greater scope for private engagement, particularly asset owners, may rely less

[19]Results remain unchanged when considering dummies for all (both unsuccessful and successful) environmental and social engagements, unsuccessful environmental and social engagements, or adopt the adjusted identification of environmental and social engagements presented in He et al. (2023). Both unsuccessful and successful engagement statuses reflect the outcome of the shareholder proposal procedure, not the subsequent outcome on the firms' sustainable or environmental performance. We define successful engagement as engagement attempts pre-emptively withdrawn by firms in no-action letters to the SEC or passed in a majority vote and unsuccessful engagements as engagements removed from the ballot by the SEC (omitted) or voted down in annual meetings.

on portfolio tilting to influence firms' sustainable performance, leading to weaker tilts toward firms with high sustainable aspirations.

Consistent with this prediction, investment managers exhibit stronger tilts toward highly ESG-rated firms and firms with high sustainable aspirations. In Panel A, Column (4), a one-standard-deviation increase in ESG ratings is associated with a 0.72% increase in asset owners' ownership relative to their average holdings, compared to a 2.00% increase for investment managers (Column (5)). Columns (9) and (10) further show that investment managers, but not asset owners, tilt toward firms with high sustainable aspirations. These results are robust to controlling for engagement success and voting behavior (Panels B and C). Overall, the inverse relationship between investors' propensity for private engagement and their tendency to tilt toward highly ESG-rated firms supports the view that engagement does not eliminate the role of intensive-margin portfolio tilting.

4.1.2 ESG ratings: Sustainable aspirations or performance?

Are these tilts intentional? In the preceding analysis, we showed that investors allocate their portfolios not only to transitioning firms but also to those with high ESG ratings. Uncovering these firms and performing intensive-margin portfolio tilting requires costly information creation. Specifically, no publicly available measure exists. Consequently, we examine the intentionality of sustainable investors in performing intensive margin-tilting by analyzing the content of ESG ratings. When ratings align with transitioning firms, it is plausible that intensive-margin portfolio tilting occurs not only by design but also, in part, as a result of ESG-rating-based tilts.

In an initial exploration, we examine whether ESG ratings reflect firms' sustainable aspirations or realized sustainability performance using four commonly employed ESG dimensions: CO_2 emissions, water use, human rights, and employee health and safety (Table 4; see Liang and Renneboog, 2017; Blakeslee et al., 2020; Bolton and Kacperczyk, 2023). We regress firms' MSCI IVA, FTSE, S&P Trucost, and Sustainalytics ESG ratings on these granular aspiration and performance measures, controlling for size, firm fixed effects, and time fixed effects. Aspiration variables capture the presence of formal sustainability commitments, while performance variables measure realized environmental and social outcomes scaled by total assets and log-

transformed. Across rating providers and ESG dimensions, we find that ESG ratings primarily reflect firms' sustainable aspirations rather than realized performance, consistent with ratings emphasizing stated commitments, particularly for transitioning firms. Firms with sustainability policies or targets receive systematically higher ESG ratings, whereas realized performance is generally unrelated to, or economically negligible in, these ratings. For example, firms with CO_2 emission policies and targets receive ESG ratings that are 0.15 to 0.76 points higher on a 0–10 scale across providers, while actual emissions have no statistically significant effect for MSCI, FTSE, and Sustainalytics and only a trivial effect for S&P Trucost (a 1% reduction in emissions increases ratings by 0.00021 points). [20]

We observe similar results when more holistically measuring firms' ESG profiles with sustainable aspirations and performance scores. In Table 5, we regress these scores on MSCI, FTSE, S&P, and Sustainalytics ESG ratings similarly to the analysis in Table 4. In a setting without controls, we observe a positive statistically significant relationship between sustainable aspiration scores and ESG ratings. In economic terms, a one standard deviation increase in aspiration scores is associated with an increase in MSCI, FTSE, S&P, and Sustainalytics ESG ratings of respectively 0.388, 0.546, 0.554, and 0.187 standard deviations in Columns 1, 4, 7, and 10, respectively.[21] In contrast to aspirations, ESG ratings are unrelated (MSCI & FTSE) or inversely (S&P & Sustainalytics) related to sustainable performance. In economic terms, a one standard deviation *increase* in firms' contemporaneous sustainable performance scores *decreases* S&P and Sustainalytics ESG ratings by 0.028 and 0.048 standard deviations. Results persist when controlling for firm size, industry, country, and firm and time fixed effects in Columns 3, 6, 9, and 12 of Table 5. Here, sustainable aspirations consistently show a positive association with ESG ratings, while the relationship between sustainable performance and ESG

[20] Similar patterns hold for water use, human rights, and employee safety, with the only economically meaningful performance effect observed for Sustainalytics human rights ratings, where adopting human rights policies is roughly equivalent to a 15% reduction in controversies.

[21] Multiply the coefficients in Table 5 with standard deviations of 1.47 for sustainable performance scores, 1.78 for sustainable aspiration scores, and divide by standard deviations of 2.47 for MSCI ESG ratings, 2.99 for FTSE ESG ratings, 2.29 for S&P ESG ratings, and 1.56 for Sustainalytics ESG ratings. To illustrate, a one standard deviation increase in aspiration scores increases MSCI ESG ratings by $\frac{0.538*1.78}{2.47} = 0.388$ standard deviations.

ratings ranges from neutral to negative.[22]

Taken together, our results indicate that ESG ratings predominantly reflect firms' sustainable aspirations rather than their sustainable performance, making them a useful tool for intensive-margin portfolio tilting. Consequently, it is plausible that the observed tilt among sustainable investors toward transitioning firms is, at least in part, an unintended consequence of how ESG ratings are constructed. One potential explanation is that they primarily rely on firms' forward-looking expectations of sustainable performance rather than rate them based on contemporary performance. This can jointly explain the tilt of sustainable investors to highly ESG-rated firms (Dyck et al., 2019; Gibson Brandon et al., 2022) as well as the limited perceived impact of such tilts (Liang et al., 2022; Kim and Yoon, 2023; Heath et al., 2023) as these firms are in the process of transitioning their operations. We do not critique ESG ratings or their content; we note only that they capture firms in transition. The extent to which aspirations matter for sustainable performance is inherently a normative question and also depends on how much firms follow through on them.

4.2 The impact of intensive-margin portfolio tilting

Having established that a substantial share of sustainable investors tilt their portfolios toward firms undergoing transition, we next examine whether these intensive-margin tilts accelerate firms' sustainable transition phase. We separately analyze three groups of firms, transitioning, already sustainable, and unsustainable not in transition ones, to reflect systematic differences in investors' tilting strategies across these categories. For transitioning firms, we expect investors to pursue intensive-margin tilts to primarily improve sustainable performance. In contrast, we expect tilts to operate primarily along the extensive margin for both sustainable and unsustainable not-in-transition firms, with limited effects on sustainable performance and the goal of expanding or contracting their scale, respectively.

We segregate firms into these three groups based on their sustainable aspiration and perfor-

[22]Our findings are robust to a further decomposition of sustainable aspiration and performance scores into ESG reporting, policy, protocol, target, output, and controversy scores (Online Appendix D). This appendix also confirms our results for industry and geographic subsamples. Furthermore, our conclusions hold when sustainable aspiration and performance scores are constructed using both SASB material and immaterial ESG information. This robustness arises because sustainability aspirations play a major role in ESG ratings and are derived primarily from firms' sustainability reports, which follow a similar data-generating process.

mance scores. Relative to industry peers, we define already sustainable firms as those in the top 20% of sustainable performance. This ensures they are sustainable and have far advanced or completed their sustainable transformation. We define transitioning firms as those with sustainable performance scores between the 20th and 80th percentiles. They are on their way to becoming sustainable, but not laggards in the industry, or already sustainable. We also denote firms as transitioning if their sustainable performance scores are below the 20th percentile and their aspiration scores are at least in the 20th percentile. These transition-phase firms lag behind but are trying to improve. Last, we define unsustainable not in transition firms as those in the bottom 20% of sustainable performance and aspirations. They are unsustainable and show no signs of improving their sustainable performance. In our sample, the relative share of transitioning, already sustainable, and unsustainable firms is 74%, 20%, and 6%.[23]

4.2.1 Portfolio tilting and capital costs

We show that intensive-margin portfolio tilting by sustainable investors is associated with reductions in firms' capital costs. Providing causal estimates of the impact of portfolio tilting on capital costs is inherently complex, as investor assignment to UN-PRI is non-random. However, our empirical estimates are unlikely to be subject to a positively biased selection effect because extensive-margin tilts will offset rather than inflate observed effects. To further reduce the potential impact of selection by PRI investors, we will only analyze lagged PRI ownership to control for contemporaneous sorting.

We estimate firms' capital costs using three cost-of-equity estimates and two cost-of-debt measures. There is no universally preferred estimation procedure because data requirements and model assumptions diverge. Lee et al. (2021) categorize cost of equity estimates into three distinct estimation techniques, namely firm characteristic-based models, implied cost of capital models, and fitted implied cost of capital models. We follow Lee et al. (2021), who suggest that the Chattopadhyay et al. (2022) firm-characteristic-based measure, the Gebhardt et al. (2001)

[23]The upcoming results remain robust when we vary these margins and expand the set of firms that are already sustainable or unsustainable and not in transition. Specifically, we find similar results when selecting all or a larger share of firms in the lowest 20% of sustainable performance as unsustainable and not in transition, or when we take cutoff points at the 75th and 85th percentiles of sustainable performance for already sustainable firms. Results are available upon request.

implied cost-of-capital measure, and the Hou et al. (2012) fitted implied cost-of-capital model provide a best-in-class estimator, and we compute estimates accordingly. Further, following Flammer (2021) and Van Binsbergen et al. (2010), we use value-weighted bond yields from WRDS and interest expense over total assets from Compustat US and Compustat Global as measures of the cost of debt. Online Appendix F provides further details on each cost of equity estimate and its respective computation.

Portfolio tilting by sustainable investors is associated with lower capital costs. Table 6 Panel A displays how past portfolio tilting relates to subsequent costs of equity and debt for transitioning firms. In Column (1), we find that firms' asset growth rate increases following the acquisition of their shares by sustainable investors. For a one-standard-deviation increase in sustainable investors' ownership, total assets increase by 2.01% per year.[24] This increase in growth rates is matched by reductions in the cost of equity in Column (2), which declines by 27.3 basis points (or 0.12 standard deviations) for a one standard deviation increase in sustainable investors' ownership. This effect is economically sizeable, with an average equity cost of 721.5 basis points, reflecting a 3.80% reduction unexplained by size, time, and firm fixed effects. Because data requirements for computing the cost of equity are relatively stringent (often requiring analyst forecasts or long, uninterrupted time series of accounting data), we also present the separate cost-of-equity estimates discussed above. For the Chattopadhyay et al. (2022) firm characteristic-based equity cost measure and the Hou et al. (2012) fitted implied cost of the capital model in Columns (3) and (4), we find that a one standard deviation increase in sustainable investors' ownership reduces capital costs by 38.8 and 22.3 basis points. For the Gebhardt et al. (2001) implied cost of capital measure in Column (5), we find an insignificant equity cost reduction. These overall results suggest a generally negative pattern between sustainable investors' portfolio tilting and the cost of equity for transitioning firms.

As portfolio tilting is equity-oriented, we anticipate the cost of equity to be more strongly affected by sustainable investors' portfolio tilting than the cost of debt. In line with this thought, we observe negative but insignificant relationships between the share of sustainable investors and firms' cost of debt, interest expense, and bond yields in Columns (6) to (8). The negative

[24] Multiply the coefficient of 16.07 by 0.1251, the standard deviation of sustainable investor ownership.

relationship between firms' equity costs and sustainable investors' portfolio tilting, in conjunction with the insignificant association with the cost of debt, suggests that portfolio tilting can enable firms to undertake otherwise unprofitable projects. Taken together, these findings indicate that intensive-margin portfolio tilting enables firms to grow more quickly early in their sustainable transition phase.

Our observed capital costs align with the in- and out-of-equilibrium fund-flow framework of Pástor et al. (2022). Transitioning firms operate out of equilibrium because they continue to improve sustainable performance through intensive-margin tilting. As performance improves, these firms attract additional extensive-margin tilts and experience declining capital costs until the transition is complete, at which point capital costs stabilize. In contrast, we expect no cost-of-capital effects for sustainable or unsustainable firms because their sustainable performance is already in a steady state, and capital costs have adjusted accordingly. Panel E confirms this prediction by showing no effect of tilting on the cost of equity or debt for firms that are already sustainable or unsustainable.

4.2.2 Sustainable transition phase

We show that intensive-margin portfolio tilting aids firms in their sustainable transition phase through three channels: increases in sustainable aspirations, additional (green) innovation, and firms increasingly materializing their sustainable aspirations. Table 6 examines how portfolio tilting supports firms' transition to sustainability. Panel B analyzes the association between portfolio tilting and sustainable aspirations, providing a direct indication of the link between sustainable investors entering firms and firms' subsequent commitments to improve ESG performance. Intensive-margin portfolio tilting can affect firms' decision-making as increases in ownership simultaneously benefit firms and pose a threat of future divestment (McCahery et al., 2016; Gantchev et al., 2022). The logic behind this analysis is that firms entering the sustainable transition phase increase their sustainability aspirations, leading to subsequent improvements in sustainable performance. Similar to the capital costs channel, positive selection biased due to extensive-margin tilts is unlikely to occur, and we reduce the impact of potential contemporaneous sorts by using the lagged share of PRI investor ownership.

Portfolio tilting of sustainable investors is positively associated with firms' sustainable aspirations for transitioning firms. In Table 6 Panel B Column (1), we analyze the effect of past PRI ownership on firms' sustainable aspiration scores. In economic terms, a one standard deviation increase in the lagged share of sustainable investors increases the sustainable aspirations of firms by 0.17 points, or 0.11 standard deviations after controlling for firm size, time, and firm fixed effects.[25]

Additionally, we observe positive relationships between firms' share of sustainable investors and their sustainable aspirations in 11 out of 14 SASB categories, namely green investments, greenhouse gas emissions, materials source management, supply chain management, business ethics, customer welfare, legal & regulatory concerns, labor practices, waste management, privacy, employee health safety in Columns (2) to (5), (7) to (12), and (14), respectively. We do not observe a positive association with water use, selling practices, and employee management. These findings suggest that intensive-margin portfolio tilting can aid transitioning firms in accelerating their sustainable transition phase across multiple sustainability aspects.

Conversely, both sustainable and unsustainable firms that receive extensive-margin portfolio tilts do not improve their sustainable aspirations. In Panel E, we find no significant effect of lagged inflows from sustainable investors on firms' sustainable aspirations. This reaffirms the distinct roles that intensive-margin and extensive-margin sustainable investors play.

4.2.3 Green innovation

Increases in sustainable aspirations are followed by substantive investments during firms' transition to sustainability. Raising aspirations initiates the transition, but firms must undertake costly, tangible investments to further improve sustainable performance, making it important to examine real actions rather than stated intent. We capture such actions using patent data from the USPTO and PatentsView.

Table 6 Panel C analyzes the relationship between past sustainable investor inflow and the sustainable innovation of transitioning firms. We find that portfolio tilting is positively associ-

[25] We compute this number by multiplying the 1.34 coefficient depicted in Column (1) of Panel B with the standard deviation of the share of sustainable investors (12.51%) and dividing it by the reported standard deviation of firms' sustainable aspiration scores (1.59). $\frac{1.34*0.1251}{1.59} = 0.105$.

ated with both the quantity and impact of innovation for transitioning firms. A one-standard-deviation increase in sustainable investor ownership is associated with a 15.6% increase in newly granted patents and a 28.6% increase in citations (Columns (1) and (2)). We further attribute these investments to technological advances in sustainability by analyzing a subset of permits classified as climate-mitigation-related under the OECD classification guidelines (following Cohen et al., 2020b). Here, a one standard deviation in lagged sustainable investor tilts similarly increases climate change mitigation patents by 7.1% (Column (3)), indicating that intensive-margin portfolio tilting is associated with economically meaningful improvements in sustainable technological performance.

As a falsification test, we split these climate-mitigation-related patents into energy, transportation, and building categories. We have removed the listed real estate firms (Real Estate Investment Trusts) from our analysis because they are classified as financial institutions that primarily affect sustainable performance through their buildings (Scope 3), for which we have limited information via LSEG. By removing these real estate firms from our sample, we do not expect to find a positive effect of portfolio tilting on building-related patents, since primarily listed real estate firms would have an incentive to invest in developing new building-related technologies. As anticipated, we observe no significant association between portfolio tilting and climate change-mitigating building patents, while energy and transportation-related patents display a positive relationship in Columns (4) to (6).

The positive joint relationship between intensive-margin portfolio tilting by sustainable investors and environmental patenting suggests that transitioning firms accelerate their sustainable transition phase in a credible and costly manner. In contrast, we do not observe shifts in the number of patents and climate-change oriented patents for already sustainable and unsustainable not in transition firms experiencing extensive-margin portfolio tilts in Panel E. This further emphasizes the difference between intensive-margin and extensive-margin portfolio tilts.

4.2.4 Intensive-margin portfolio tilting: High or low pollution firms

While intensive-margin sustainable tilts aid firms in transitioning their operations on average, there may be heterogeneity in the types of firms they affect. Not all transitioning firms have

an equal impact on environmental and social issues. Particularly, Hartzmark and Shue (2023) argue that portfolio tilting is most effective in improving aggregate emissions when targeting firms with high absolute emissions, i.e., putting pressure on firms with the most capacity to change. Where we find that sustainable investors tilt toward transitioning firms, our analysis considers firms' sustainable performance and aspirations within the industry by constructing an industry-specific rank-ordering methodology. Therefore, we provide additional robustness by showing that our findings are not solely driven by investors tilting transitioning tech firms but also firms in more heavily polluting industries such as mining, construction, utility, and (petrochemical) manufacturing. We replace our prior findings on the influence of portfolio tilting on sustainable aspirations, green innovation, and capital costs in Table 6 Panel D.

Firms in heavily polluting industries experience larger reductions in capital costs than firms in less polluting sectors with respect to intensive-margin portfolio titles in Columns (1) and (2) compared to (6) and (7). Specifically, the cost of equity decreases by 40.2 for a one-standard-deviation increase in firms' lagged PRI ownership (12.51%) for heavily polluting transitioning firms. Conversely, the cost-of-equity effects are only 21.1 basis points for less-polluting transitioning firms and are statistically insignificant at the 5% level. Moreover, we find that reductions in the cost of debt are observed only among heavily polluting firms, with a 19.5-basis-point reduction for a one-standard-deviation increase in firms' lagged PRI ownership. This shows that portfolio tilting would, if anything, enable firms in more polluting industries to transition their operations more with cheaper capital. Following reductions in capital costs, heavily polluting transitioning firms pursue more sustainable aspirations after being tilted and pivot their innovation toward climate-change-related patents while keeping total innovation constant, see Columns (3) to (5). Conversely, although less polluting firms exhibit greater sustainable aspirations and overall innovation, they do not improve on climate-change-related innovation; see Columns (8) to (10). The above shows that sustainable investors aid precisely those firms with the most significant capacity to transition their economies sustainably by tilting at the intensive margin.

4.2.5 Sustainable aspirations materialize

Sustainable aspirations tend to materialize only gradually, which helps explain the limited short-run improvements in sustainable performance documented in prior work on portfolio tilting (Gantchev et al., 2022; Gibson Brandon et al., 2022; Liang et al., 2022; Kim and Yoon, 2023; Heath et al., 2023). Rather than focusing on short-term outcomes, we study whether, where, and how quickly firms begin to realize their stated sustainability aspirations as they progress through their transition phase. Specifically, we ask whether aspirations increasingly translate into performance, whether this materialization is strongest where investor pressure is greatest, and whether the speed of adjustment varies across sustainability dimensions.

To assess firms' progress, we examine how closely sustainable performance aligns with previously stated aspirations over a 15-year horizon. When firms enter the sustainable transition phase, aspirations typically precede operational change, implying a weak contemporaneous relationship between aspirations and performance. As firms progress through the transition, this relationship should strengthen. We therefore expect the association between aspirations and subsequent performance to become more positive for more recent aspirations.

Consistent with this prediction, Table 7 shows that firms' recent sustainable aspirations are more strongly associated with current sustainable performance than more distant aspirations. Estimating each lag separately to accommodate expanding LSEG coverage over time, we find that aspirations predict performance only in the most recent four years, with effects that increase monotonically as aspirations become more recent.[26] This pattern indicates that firms have only recently begun to implement their sustainability commitments, consistent with an early stage of the transition process.

We next examine cross-sectional variation across ESG dimensions to assess whether aspira-

[26]LSEG ESG started reporting ESG information for S&P 500, Nasdaq 100, FTSE 100 and 250, DAX, and CAC40 firms in 2003, covered the DJ STOXX and MSCI World in 2008, Russel 1,000 and MSCI emerging markets in 2011, Bovespa in 2012, S&P ASX 300 n 2013, S&P NSX 50 in 2016, Russel 2,000 and 3,000, IPC 35, IPSA 40, MERVAL, COLCAP, and Peru General Index in 2017, MSCI Emerging markets China in 2018, MSCI Europe Small and Medium cap in 2019, China, Singapore, European small/mid cap, Canada (TSX) in 2020, CSI 300 in 2021, and CSI 500, FTSE Bursa-Malysia, and FTSE all world in 2022. When estimating 15 lags in a single regression, we would consider only firms with 15 years of consecutive data, thereby removing most of the sample. Conversely, when assessing each lag individually, we allow for firms with partial LSEG coverage to be considered. We report the average adjusted R^2s and the number of observations across the 15 regression analyses. We correct for size, time, and firm fixed effects in each estimation.

tions materialize more strongly in areas prioritized by investors. Investor attention has recently focused in particular on CO_2 emissions and biodiversity (Krueger et al., 2020; Giglio et al., 2024). Accordingly, firms are likely to be earlier in their transition and to display more rapid progress in these dimensions. Moreover, we expect faster materialization in areas that are less time-intensive to adjust.

Consistent with these predictions, firms follow through more quickly on aspirations related to green investments (Column (2), 0.19 s.d. increase in performance for a one-unit increase in aspiration) than on aspirations to reduce direct CO_2 emissions (Column (3), 0.06 s.d. for a similar increase). While emissions reductions often require long-lived capital replacement, green investments can be implemented earlier. Empirically, aspirations related to green investments become strongly positively associated with performance in recent years, whereas the relationship between emission-reduction aspirations and performance turns positive only recently and remains economically smaller. This pattern suggests that firms have only recently begun transitioning on emissions-intensive activities and that these transitions unfold slowly.

We observe similar dynamics for biodiversity-related dimensions in Columns (4) to (6). Firms are more likely to realize aspirations related to resource use, particularly along the extensive margin, such as shifting toward more sustainable suppliers, than aspirations that require intensive supply-chain transformations. While recent aspirations predict improvements in resource-use performance, supply-chain management remains in an early transition stage, with aspirations not yet translating into improved outcomes. Aspirations related to water use show a comparable pattern, materializing primarily in recent periods.

In contrast, for ESG dimensions that have experienced less recent increases in investor attention, including business ethics, labor practices, customer welfare, privacy, and employee engagement, we find limited evidence that aspirations translate into subsequent performance improvements. Across these areas, the relationship between aspirations and performance remains weak and largely unchanged over time.

Taken together, these results indicate that firms' sustainable transitions are selective and gradual. Aspirations materialize most clearly in ESG dimensions that receive heightened investor attention and are operationally quicker to adjust, while progress remains limited in less

salient or more time-intensive areas. These findings support the view that sustainable investor tilts facilitate firms' transitions by shaping both the direction and speed of operational change.

Given the above, we provide supportive evidence that sustainable investors' portfolio tilting aids firms in their sustainable transition phase as 1) they target transitioning firms that have the capacity to improve their sustainable performance, 2) their tilts reduce capital costs, 3) let firms adopt more ambitious sustainable aspirations, 4) successfully invest in green technologies, and 5) aspirations start materializing most strongly where investor pressure is most pronounced. In short, sustainable investors appear not to be "tilting the wrong firms" but instead making a targeted effort to aid those firms precisely most in need of capital to improve their sustainable performance.

5 Conclusion

This paper examines how, and under what conditions, portfolio choice can reduce social and environmental externalities. While portfolio tilting is often understood as reallocating capital toward already sustainable firms, recent evidence questions its effectiveness when assessed solely through capital-cost or scale channels. We argue that this skepticism reflects an incomplete characterization of tilting itself. Portfolio tilting is not a uniform strategy: its implications depend on whether investors aim to expand the scale of firms with strong sustainability performance or to influence the behavior of firms that are still transitioning their operations.

We formalize this distinction by separating extensive-margin from intensive-margin tilting. Extensive-margin tilting targets firms with high existing sustainability performance, whereas intensive-margin tilting targets firms with rising sustainability aspirations that signal an ongoing transition. Using global ownership data, we provide evidence that socially responsible investors predominantly tilt on the intensive margin. Investors increase holdings in transitioning firms, and these reallocations are followed by lower costs of equity, faster adoption of sustainability goals, increased green innovation, and, over longer horizons, improvements in sustainability outcomes. These effects are concentrated among transitioning firms and are absent for firms that are already sustainable or persistently unsustainable, underscoring the

importance of distinguishing between the two tilting strategies.

In practice, our findings suggest that investors, regulators, and stakeholders should recalibrate expectations regarding the pace of sustainable change. Portfolio tilting is unlikely to yield immediate performance gains but can be a powerful lever for accelerating the transition to sustainability. For investors with consequentialist motives, recognizing the intensive-margin pathway provides a strategic blueprint: focus on firms with credible aspirations and the capacity for change, particularly in sectors with high environmental impact rather than already sustainable firms. For policymakers, understanding that ESG ratings primarily capture aspirations underscores the need for complementary performance disclosure standards. For firms, the results highlight that attracting sustainable capital hinges not only on current performance but also on a demonstrable commitment to and progress through the transition phase.

Bibliography

Ahn, B. H., Patatoukas, P. N. and Skiadopoulos, G. S. (2024). Material ESG alpha: A fundamentals-based perspective, *Accounting Review* pp. 1–27.

Akey, P. and Appel, I. (2019). Environmental externalities of activism, *Available at SSRN 3508808* .

Aswani, J., Raghunandan, A. and Rajgopal, S. (2024). Are carbon emissions associated with stock returns?, *Review of Finance* **28**(1): 75–106.

Bauer, R., Ruof, T. and Smeets, P. (2021). Get real! individuals prefer more sustainable investments, *Review of Financial Studies* **34**(8): 3976–4043.

Bebchuk, L. A., Cohen, A. and Hirst, S. (2017). The agency problems of institutional investors, *Journal of Economic Perspectives* **31**(3): 89–112.

Berg, F., Fabisik, K. and Sautner, Z. (2020). Rewriting history II: The (un) predictable past of ESG ratings, *European Corporate Governance Institute Working Paper* **708/2020**.

Berg, F., Koelbel, J. F. and Rigobon, R. (2022). Aggregate confusion: The divergence of ESG ratings, *Review of Finance* **26**(6): 1315–1344.

Berk, J. B. and Van Binsbergen, J. H. (2025). The impact of impact investing, *Journal of Financial Economics* **164**: 103972.

Blakeslee, D., Fishman, R. and Srinivasan, V. (2020). Way down in the hole: Adaptation to long-term water loss in rural india, *American Economic Review* **110**(1): 200–224.

Bolton, P. and Kacperczyk, M. (2023). Global pricing of carbon-transition risk, *Journal of Finance* **78**(6): 3677–3754.

Bonnefon, J.-F., Landier, A., Sastry, P. and Thesmar, D. (2025). The moral preferences of investors: Experimental evidence, *Journal of Financial Economics* **163**: 103955.

Broccardo, E., Hart, O. and Zingales, L. (2022). Exit versus voice, *Journal of Political Economy* **130**(12): 3101–3145.

Ceccarelli, M., Glossner, S., Homanen, M. and Schmidt, D. (2021). Which institutional investors drive corporate sustainability?, *Available at SSRN:* **3988058**.

Chatterji, A. K., Durand, R., Levine, D. I. and Touboul, S. (2016). Do ratings of firms converge? Implications for managers, investors and strategy researchers, *Strategic Management Journal* **37**(8): 1597–1614.

Chattopadhyay, A., Lyle, M. R. and Wang, C. C. (2022). Expected stock returns worldwide: A log-linear present-value approach, *Accounting Review* **97**(2): 107–133.

Christensen, D. M. (2016). Corporate accountability reporting and high-profile misconduct, *Accounting Review* **91**(2): 377–399.

Christensen, D. M., Serafeim, G. and Sikochi, A. (2022). Why is corporate virtue in the eye of the beholder? The case of ESG ratings, *Accounting Review* **97**(1): 147–175.

Christensen, H. B., Hail, L. and Leuz, C. (2021). Mandatory CSR and sustainability reporting: Economic analysis and literature review, *Review of accounting studies* **26**(3): 1176–1248.

Cohen, L., Gurun, U. G. and Nguyen, Q. H. (2020a). The ESG-innovation disconnect: Evidence from green patenting, *Technical report*, National Bureau of Economic Research.

Cohen, L., Gurun, U. G. and Nguyen, Q. H. (2020b). The esg-innovation disconnect: Evidence from green patenting, *Technical report*, National Bureau of Economic Research.

Cohen, S., Kadach, I. and Ormazabal, G. (2023). Institutional investors, climate disclosure, and carbon emissions, *Journal of Accounting and Economics* **76**(2-3): 101640.

Colmer, J., Martin, R., Muûls, M. and Wagner, U. J. (2024). Does pricing carbon mitigate climate change? Firm-level evidence from the european union emissions trading system, *Review of Economic Studies* p. rdae055.

Cooper, R. W. and Haltiwanger, J. C. (2006). On the nature of capital adjustment costs, *Review of Economic Studies* **73**(3): 611–633.

Darendeli, A., Law, K. K. and Shen, M. (2022). Green new hiring, *Review of Accounting Studies* **27**(3): 986–1037.

Dasgupta, S., Huynh, T. D. and Xia, Y. (2023). Joining forces: The spillover effects of EPA enforcement actions and the role of socially responsible investors, *Review of Financial Studies* **36**(9): 3781–3824.

Dechow, P. M. (2023). Understanding the sustainability reporting landscape and research opportunities in accounting, *The Accounting Review* **98**(5): 481–493.

Dimson, E., Karakaş, O. and Li, X. (2023). Coordinated engagements, *European Corporate Governance Institute–Finance Working Paper* (721).

Dyck, A., Lins, K. V., Roth, L. and Wagner, H. F. (2019). Do institutional investors drive corporate social responsibility? International evidence, *Journal of Financial Economics* **131**(3): 693–714.

Engler, D., Gutsche, G. and Smeets, P. (2025). Why do investors pay higher fees for sustainable investments: An experiment in five european countries, *SSRN* .

Flammer, C. (2021). Corporate green bonds, *Journal of Financial Economics* **142**(2): 499–516.

Frankel, R., Kothari, S. and Raghunandan, A. (2025). The economics of ESG disclosure regulation, *Review of Accounting Studies* pp. 1–36.

Gantchev, N., Giannetti, M. and Li, R. (2022). Does money talk? divestitures and corporate environmental and social policies, *Review of Finance* .

Gebhardt, W. R., Lee, C. M. and Swaminathan, B. (2001). Toward an implied cost of capital, *Journal of Accounting Research* **39**(1): 135–176.

Gibson Brandon, R., Glossner, S., Krueger, P., Matos, P. and Steffen, T. (2022). Do responsible investors invest responsibly?, *Review of Finance* **26**(6): 1389–1432.

Giglio, S., Kuchler, T., Stroebel, J. and Zeng, X. (2024). Biodiversity risk, *Technical report*, National Bureau of Economic Research.

Gipper, B., Ross, S. and Shi, S. X. (2025). ESG assurance in the united states, *Review of Accounting Studies* **30**(2): 1753–1803.

Godfrey, P. C. (2005). The relationship between corporate philanthropy and shareholder wealth: A risk management perspective, *Academy of Management Review* **30**(4): 777–798.

Hartzmark, S. M. and Shue, K. (2023). Counterproductive impact investing: The impact elasticity of brown and green firms, *Available at SSRN 4359282* .

Hartzmark, S. M. and Shue, K. (2025). Counterproductive impact investing: The impact elasticity of brown and green firms, *Available at SSRN 4359282* .

Hartzmark, S. M. and Sussman, A. B. (2019). Do investors value sustainability? A natural experiment examining ranking and fund flows, *Journal of Finance* **74**(6): 2789–2837.

He, Y. E., Kahraman, B. and Lowry, M. (2023). ES risks and shareholder voice, *Review of Financial Studies* **36**(12): 4824–4863.

Heath, D., Macciocchi, D., Michaely, R. and C. Ringgenberg, M. (2023). Does socially responsible investing change firm behavior?, *Review of Finance* **27**(6): 2057–2083.

Hirschman, A. O. (1972). *Exit, voice, and loyalty: Responses to decline in firms, organizations, and states*, Harvard university press.

Hou, K., Van Dijk, M. A. and Zhang, Y. (2012). The implied cost of capital: A new approach, *Journal of Accounting and Economics* **53**(3): 504–526.

Hsu, P.-H., Li, K. and Tsou, C.-Y. (2023). The pollution premium, *Journal of Finance* **78**(3): 1343–1392.

Ilhan, E., Krueger, P., Sautner, Z. and Starks, L. T. (2023). Climate risk disclosure and institutional investors, *Review of Financial Studies* **36**(7): 2617–2650.

Ivković, Z. and Weisbenner, S. (2009). Individual investor mutual fund flows, *Journal of Financial Economics* **92**(2): 223–237.

Khan, M., Serafeim, G. and Yoon, A. (2016). Corporate sustainability: First evidence on materiality, *Accounting Review* **91**(6): 1697–1724.

Kim, S. and Yoon, A. (2023). Analyzing active fund managers' commitment to ESG: Evidence from the United Nations Principles for Responsible Investment, *Management Science* **69**(2): 741–758.

Krueger, P., Sautner, Z. and Starks, L. T. (2020). The importance of climate risks for institutional investors, *Review of Financial Studies* **33**(3): 1067–1111.

Krueger, P., Sautner, Z., Tang, D. Y. and Zhong, R. (2024). The effects of mandatory ESG disclosure around the world, *Journal of Accounting Research* **62**(5): 1795–1847.

Lee, C. M., So, E. C. and Wang, C. C. (2021). Evaluating firm-level expected-return proxies: Implications for estimating treatment effects, *Review of Financial Studies* **34**(4): 1907–1951.

Li, X., Lou, Y. and Zhang, L. (2024). Do commercial ties influence esg ratings? evidence from moody's and s&p, *Journal of Accounting Research* **62**(5): 1901–1940.

Liang, H. and Renneboog, L. (2017). On the foundations of corporate social responsibility, *Journal of Finance* **72**(2): 853–910.

Liang, H., Sun, L. and Teo, M. (2022). Responsible hedge funds, *Review of Finance* **26**(6): 1585–1633.

Lin, Y., Shen, R., Wang, J. and Julia Yu, Y. (2024). Global evolution of environmental and social disclosure in annual reports, *Journal of Accounting Research* **62**(5): 1941–1988.

McCahery, J. A., Sautner, Z. and Starks, L. T. (2016). Behind the scenes: The corporate governance preferences of institutional investors, *Journal of Finance* **71**(6): 2905–2932.

Naaraayanan, S. L., Sachdeva, K. and Sharma, V. (2021). The real effects of environmental activist investing, *European Corporate Governance Institute–Finance Working Paper* (743).

Pástor, L., Stambaugh, R. F. and Taylor, L. A. (2022). Dissecting green returns, *Journal of Financial Economics* **146**(2): 403–424.

Pástor, L., Stambaugh, R. F. and Taylor, L. A. (2025). Green tilts, *Technical report*, National Bureau of Economic Research.

Raghunandan, A. and Rajgopal, S. (2022). Do esg funds make stakeholder-friendly investments?, *Review of Accounting Studies* **27**(3): 822–863.

Reitmaier, C., Schultze, W. and Vollmer, J. (2024). Corporate responsibility and corporate misbehavior: are CSR reporting firms indeed responsible?, *Review of Accounting Studies* **30**(2): 1804–1872.

Riedl, A. and Smeets, P. (2017). Why do investors hold socially responsible mutual funds?, *Journal of Finance* **72**(6): 2505–2550.

Shapiro, J. S. and Walker, R. (2018). Why is pollution from us manufacturing declining? The roles of environmental regulation, productivity, and trade, *American Economic Review* **108**(12): 3814–54.

Van Binsbergen, J. H., Graham, J. R. and Yang, J. (2010). The cost of debt, *Journal of Finance* **65**(6): 2089–2136.

van der Kroft, B., Palacios, J., Rigobon, R. and Zheng, S. (2025). Timing sustainable engagement in real asset investments, *Technical report*, SSRN.

Wittkowski, K. M., Lee, E., Nussbaum, R., Chamian, F. N. and Krueger, J. G. (2004). Combining several ordinal measures in clinical studies, *Statistics in Medicine* **23**(10): 1579–1592.

Wu, Y., Zhang, K. and Xie, J. (2020). Bad greenwashing, good greenwashing: Corporate social responsibility and information transparency, *Management Science* **66**(7): 3095–3112.

Xu, Q. and Kim, T. (2021). Financial Constraints and Corporate Environmental Policies, *Review of Financial Studies* **35**(2): 576–635.
URL: *https://doi.org/10.1093/rfs/hhab056*

Xue, H. (2025). ESG disclosure, market forces, and investment efficiency, *The Accounting Review* **100**(5): 439–467.

6 Tables and Figures

Table 1: Summary statistics

This table provides summary statistics on granular ESG information in our sample. In the first part of the table, we display summary statistics for the Wittkowski et al. (2004) scores and sub-scores as computed in Equations 1 and 2. All scores are industry-year specific and scaled from 0 to 10, for which 0 is inferior, and 10 is superior. To elaborate, firms with ESG scores of 10 in controversies and policies have no controversies and superior ESG policies compared to other firms in that industry. In the second part, we report granular ESG variables by SASB materiality group as given in Column 1. The categories critical incident management and systemic risk do not strictly follow the SASB definition as they also contain controversies variables. Subsequently, we categorize our data into ESG reporting, policies, protocols, targets, outputs, and controversies in Column (3). Columns (4) to (8) respectively contain the number of observations, mean, standard deviation, minimum, and maximum for all granular ESG variables.

SASB materiality group	Variable name	ESG type	N	mean	sd	min	max
ESG ratings and scores							
	FTSE ESG rating		23,320	4.22	2.99	0.00	10.00
	MSCI ESG rating		7,697	4.79	2.57	0.00	10.00
	S&P ESG rating		27,701	3.90	2.29	0.00	10.00
	Sustainalytics ESG rating		29,050	6.49	1.56	0.00	10.00
	Forward-looking sustainable aspiration score		67,258	6.05	1.77	0.00	10.00
	Contemporaneous sustainable performance score		67,258	4.58	1.45	0.00	10.00
	Reporting sub-score		67,258	3.88	3.46	0.00	10.00
	Policy sub-score		67,258	5.09	2.06	0.00	10.00
	Protocol sub-score		67,258	5.13	2.67	0.00	10.00
	Target sub-score		67,258	2.67	3.57	0.00	10.00
	Performance sub-score		67,258	4.81	1.54	0.00	10.00
	Controversy sub-score		67,258	7.26	3.40	0.00	10.00
Granular ESG information							
Greenhouse gas emissions	Emission policy	Policy	67,258	0.60	0.49	0.00	1.00
	Emission trading	Protocol	67,258	0.09	0.29	0.00	1.00
	Emission targets	Target	67,258	0.34	0.47	0.00	1.00
	Emission reduction target (%)	Target	67,258	6.55	19.43	0.00	100.00
	CO_2 Emissions	Output	64,682	0.00	0.01	-0.00	2.61
	Staff transportation impact reduction	Protocol	67,258	0.17	0.37	0.00	1.00
Air quality	Ozone-depleting substances	Output	67,258	0.02	0.12	0.00	1.00
	NO_x and SO_x Emissions	Output	13,443	0.00	0.04	0.00	2.86
	NO_x and SO_x Emission reduction	Output	67,258	0.19	0.40	0.00	1.00
	VOC and PM Emissions	Output	66,212	0.16	0.36	0.00	1.00
	VOC and PM Emission reduction	Output	67,258	0.14	0.35	0.00	1.00
Energy management	Energy efficiency policy	Policy	67,258	0.62	0.49	0.00	1.00
	Energy efficiency targets	Target	67,258	0.21	0.41	0.00	1.00
	Renewable energy ratio	Output	66,626	0.40	0.49	0.00	1.00
Water and wastewater	Water efficiency policy	Policy	67,258	0.46	0.50	0.00	1.00
	Water technologies	Protocol	67,258	0.06	0.24	0.00	1.00
	Water efficiency targets	Target	67,258	0.15	0.35	0.00	1.00
	Water usage / assets	Output	26,653	18,032.75	361,246.01	0.00	32,055,458.77
	Water recycled	Output	6,535	0.02	0.38	0.00	22.16
	Water pollutant emissions	Output	5,658	0.00	0.02	0.00	1.67
Waste & hazardous management	Waste reduction initiatives	Protocol	67,258	0.60	0.49	0.00	1.00
	Waste	Output	22,941	1,025.91	10,812.32	0.00	644,208.43
	Waste recycled (%)	Output	67,258	0.17	0.32	0.00	1.00
	Hazardous waste	Output	15,447	0.00	0.00	-0.00	0.08
	Toxic chemicals reduction	Output	67,258	0.15	0.36	0.00	1.00
	Electronic waste reduction	Output	67,258	0.15	0.36	0.00	1.00
Ecological impact	Environmental restoration initiatives	Protocol	67,258	0.48	0.50	0.00	1.00
	Land environmental impact reduction	Policy	67,258	0.08	0.28	0.00	1.00
	Biodiversity impact reduction	Policy	67,258	0.23	0.42	0.00	1.00
Human rights & Community relations	Policy human rights	Policy	67,258	0.50	0.50	0.00	1.00
	Policy Community involvement	Policy	67,258	0.72	0.45	0.00	1.00
	Human rights compliance ILO/UN	Policy	67,258	0.22	0.42	0.00	1.00
	Donations	Output	67,258	60.54	15490.96	0.00	4,017,401.40

Continued

Table 1 – continued

SASB materiality group	Variable name	ESG type	N	mean	sd	min	max
Customer privacy	Controversies privacy	Controversy	67,258	0.02	0.34	0.00	53.00
	Policy data privacy	Policy	67,258	0.62	0.48	0.00	1.00
	Whistle-blower protection	Policy	67,258	0.60	0.49	0.00	1.00
Data security	HSMS certified percent	Policy	67,258	0.04	0.18	0.00	1.00
Access and affordability	Product discount emerging markets	Protocol	63,221	0.01	0.08	0.00	1.00
	Product access low prices	Protocol	67,258	0.04	0.20	0.00	1.00
Product quality and safety	Policy customer health safety	Policy	67,258	0.27	0.44	0.00	1.00
	Product recall	Output	67,258	0.03	0.16	0.00	1.00
Customer welfare	Product responsibility monitoring	Protocol	67,258	0.14	0.34	0.00	1.00
	Healthy food/products	Protocol	67,258	0.09	0.28	0.00	1.00
Selling practices and product labeling	Controversies consumer complaints	Controversy	67,258	0.01	0.12	0.00	1.00
	Policy responsible marketing	Policy	67,258	0.03	0.18	0.00	1.00
	Policy fair trade	Policy	67,258	0.02	0.12	0.00	1.00
	Retailing responsibilities	Protocol	67,258	0.01	0.11	0.00	1.00
	Ethical trading initiatives	Policy	67,258	0.00	0.06	0.00	1.00
	Customer satisfaction	Output	67,258	0.06	0.23	0.00	1.00
Labor practices	Controversies wages working conditions	Controversy	67,258	0.02	0.14	0.00	1.00
	Policy child labor	Policy	67,258	0.33	0.47	0.00	1.00
	Policy forced labor	Policy	67,258	0.32	0.47	0.00	1.00
	Policy training and development	Policy	67,258	0.68	0.47	0.00	1.00
	Day care service	Protocol	67,258	0.14	0.34	0.00	1.00
	Employee engagement voluntary work	Policy	67,258	0.53	0.50	0.00	1.00
	Training hours	Output	32,682	15.90	64.52	0.00	10,071.00
	Employee fatalities / assets	Output	18,560	0.84	3.62	0.00	253.00
	Flexible working hours	Protocol	67,258	0.26	0.44	0.00	1.00
	Employee satisfaction	Output	5,587	76.93	10.26	0.66	100.00
	Salaries/wages	Output	7,125	163,727.33	204,290.22	107.02	997,475.35
	Net employment creation / assets	Output	58,933	6.79	17.82	-20.50	58.24
	Employee turnover	Output	18,517	13.25	11.28	0.00	100.00
	Strikes	Controversy	67,258	0.02	0.13	0.00	1.00
Employee health and safety	Health safety policy	Policy	67,258	0.74	0.44	0.00	1.00
	Employee health safety team	Protocol	67,258	0.44	0.50	0.00	1.00
	Health safety training	Protocol	67,258	0.60	0.49	0.00	1.00
	Accidents total	Output	19,626	375.34	2,606.40	0.00	128,800.00
	Injury rate	Output	20,621	6.71	10.96	0.00	309.29
	Occupational diseases	Output	6,498	0.50	2.13	0.00	76.00
Employee engagement	Policy board diversity	Policy	67,258	0.53	0.50	0.00	1.00
	Policy diversity and opportunity	Policy	67,258	0.69	0.46	0.00	1.00
	Internal promotion	Protocol	67,258	0.29	0.45	0.00	1.00
	HRC corporate equality index	Output	5,297	71.77	33.47	-25.00	100.00
	Targets diversity and opportunity	Target	58,411	0.14	0.34	0.00	1.00
	Salary gap (%)	Output	8,518	36.37	45.20	0.00	100.00
	Women employees	Output	67,258	0.15	0.20	0.00	0.99
	Employees with disabilities	Output	8,558	1.92	1.66	0.00	20.00
Product design and life-cycle management	Sustainable packaging policy	Policy	67,258	0.19	0.39	0.00	1.00
	Take-back and recycling initiatives	Protocol	67,258	0.10	0.30	0.00	1.00
	Environmental material sourcing	Protocol	67,258	2.54e+08	8.91e+09	0.00	9.49e+11
	Environmental products	Protocol	67,258	0.23	0.42	0.00	1.00
	Eco-design products	Protocol	67,258	0.12	0.32	0.00	1.00
	Renewable energy products	Protocol	67,258	0.02	0.11	0.00	1.00
	Sustainable building products	Protocol	67,258	0.05	0.21	0.00	1.00
	Product impact minimization	Protocol	67,258	0.20	0.40	0.00	1.00
	Product environmental responsibilities	Protocol	67,258	0.40	0.49	0.00	1.00
Business model resilience	Environment management team	Policy	67,258	0.02	0.23	0.00	16.00
	CSR sustainability committee	Policy	67,258	0.50	0.50	0.00	1.00
	Global compact signatory	Reporting	67,258	0.15	0.36	0.00	1.00
	Sustainability compensation executives	Protocol	67,258	0.17	0.38	0.00	1.00
	Integrated strategy in MDA	Policy	67,258	0.20	0.40	0.00	1.00
	Environmental project financing	Protocol	67,258	0.43	0.50	0.00	1.00
	Environment management training	Policy	67,258	2.58e+09	6.35e+10	0.00	8.75e+12
	Green buildings	Output	67,258	0.19	0.39	0.00	1.00

Continued

Table 1 – continued

SASB materiality group	Variable name	ESG type	N	mean	sd	min	max
	Environmental investment initiatives	Protocol	67,258	0.00	0.06	0.00	1.00
	Six sigma and quality management system	Policy	67,258	0.18	0.39	0.00	1.00
	Environmental provisions / assets	Protocol	18,316	0.00	0.00	0.00	0.00
	Environmental expenditures / assets	Output	64,282	0.00	0.00	0.00	0.00
	Environmental investment expenditures	Output	67,258	0.37	0.48	0.00	1.00
Supply chain management	Environmental partnership	Protocol	67,258	2.98e+08	5.80e+09	0.00	3.95e+11
	Contractor human rights breaches	Output	67,258	0.15	0.35	0.00	1.00
	Human rights contractors	Protocol	67,258	0.36	0.48	0.00	1.00
	Supplier ESG training	Protocol	67,258	0.15	0.36	0.00	1.00
	Environmental supply chain policy	Policy	67,258	0.44	0.50	0.00	1.00
	Environmental supply chain management	Policy	67,258	269.93	5,077.58	0.00	821,019.39
	Policy supply chain health safety	Policy	67,258	0.26	0.44	0.00	1.00
	Lost time injury rate contractors (%)	Output	3,845	1.65	3.48	0.00	39.84
Material Sourcing and efficiency	Resource reduction policy	Policy	67,258	0.73	0.44	0.00	1.00
	Organic product initiatives	Protocol	67,258	0.04	0.21	0.00	1.00
	Resource reduction targets	Target	67,258	0.25	0.43	0.00	1.00
	Energy usage	Output	67,258	0.00	0.03	0.00	2.97
	Renewable energy usage	Output	67,258	0.00	0.03	0.00	4.52
Physical impact of climate change	Climate change commercial risk	Controversy	67,258	0.40	0.49	0.00	1.00
Business Ethics	Controversies tax fraud	Controversy	67,258	0.01	0.11	0.00	7.00
	Controversies business ethics	Controversy	67,258	0.05	0.46	0.00	46.00
	Controversy bribery corruption and fraud	Controversy	67,258	0.07	0.25	0.00	1.00
	Controversies intellectual property	Controversy	67,258	0.03	0.35	0.00	21.00
	Policy bribery and corruption	Policy	67,258	0.67	0.47	0.00	1.00
	Policy business ethics	Policy	67,258	0.69	0.46	0.00	1.00
	Animal testing	Protocol	67,258	0.07	0.26	0.00	1.00
Competitive behavior	Policy fair competition	Policy	67,258	0.54	0.50	0.00	1.00
	Trade union representation	Protocol	67,258	0.14	4.90	0.00	1,268.78
	Poison pill	Controversy	67,258	0.05	0.21	0.00	1.00
Legal & regulatory environment	Quality management systems	Policy	67,258	0.44	0.50	0.00	1.00
	OECD guidelines for multinationals	Policy	67,258	0.06	0.23	0.00	1.00
	Stakeholder engagement	Protocol	67,258	0.42	0.49	0.00	1.00
	Real estate sustainability certificate	Policy	67,258	0.02	0.15	0.00	1.00
	Corporate responsibility awards	Output	67,258	0.35	0.48	0.00	1.00
	Self-reported environmental fines	Output	67,258	0.00	0.01	0.00	0.80
Critical incident risk management	Accounting controversies	Controversy	67,258	0.00	0.07	0.00	1.00
	Crisis management systems	Policy	67,258	0.43	0.49	0.00	1.00
	Controversies public health	Controversy	67,258	0.01	0.13	0.00	8.00
	Accidental spills	Controversy	2,806	1.00	0.00	1.00	1.00
Systemic risk management	Environmental controversies	Controversy	67,258	0.17	0.37	0.00	1.00
	Controversies anti-competition	Controversy	67,258	0.07	0.55	0.00	60.00
	Controversies responsible marketing	Controversy	67,258	0.06	0.56	0.00	5.00
	Obesity risk	Controversy	67,258	0.01	0.11	0.00	1.00
	Controversies product quality	Controversy	67,258	0.04	0.18	0.00	1.00
	Controversies customer health	Controversy	67,258	0.03	0.48	0.00	65.00
Reporting	ESG reporting scope	Reporting	67,258	0.59	0.49	0.00	1.00
	GRI reporting guidelines	Reporting	67,258	0.36	0.48	0.00	1.00
	Global CSR sustainability report	Reporting	67,258	0.53	0.50	0.00	1.00
	CSR sustainability external audit	Reporting	67,258	0.24	0.43	0.00	1.00
	ESG reporting scope	Reporting	67,258	47.26	47.64	0.00	100.00
	Global compact signatory	Reporting	67,258	0.15	0.36	0.00	1.00

Table 2: Validation of sustainable aspirations and performance scores using EPA TRI data

This table validates the sustainable aspiration and performance scores of firms using established measures of environmental aspirations and performance for US heavy manufacturing firm in the EPA Pollution Prevention (P2), Toxic Releases, and Environmental Fines (ECHO) data (see, Shapiro and Walker, 2018; Akey and Appel, 2019; Xu and Kim, 2021; Dasgupta et al., 2023; Hsu et al., 2023). Columns (1) to (2), regresses sustainable aspirations and performance scores on the natural logarithm of pollution prevention activities. Columns (3) to (6) follow similar regressions for toxic releases divided by revenue or cost of goods sold. Columns (7) to (10) adopt the number and the log amount of EPA penalties as the dependent variable. Plant-chemical clustered standard errors are given in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

VARIABLES	Pollution Prevention		$\frac{ToxicRelease}{Revenue}$		$\frac{ToxicRelease}{COGS}$		Penalties (#)		Penalty amount	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sustainable Aspirations	0.033***		0.001		-0.001		-0.000		0.269***	
	(0.006)		(0.002)		(0.002)		(0.004)		(0.052)	
Sustainable Performance		-0.002		-0.014***		-0.015***		-0.021**		-0.415***
		(0.006)		(0.002)		(0.002)		(0.009)		(0.126)
Observations	19,611	19,611	243,050	243,050	243,050	243,050	4,357	4,357	4,357	4,357
Adjusted R-squared	0.754	0.753	0.907	0.907	0.909	0.909	0.420	0.478	0.612	0.680
Size	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES
Firm FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES
Plant X Chemical FE	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO
Chemical X Year FE	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO

Table 3: Do investors tilt at the intensive-margin?

This table analyzes whether sustainable investors tilt their portfolios toward firms with high ESG ratings, sustainable aspirations, or sustainable performance. We analyze five groups of investors, namely combined institutional investor ownership, Non-PRI conventional investors, sustainable investors signatory to the PRI, sustainable PRI asset owners (abbreviated AO), and sustainable PRI investment managers (abbreviated IM) by collecting their holdings using Thompson Reuters 13F forms. We compute the share of institutional ownership at the firm level for each of these investor types. The average ESG rating represents the equally weighted ESG rating of MSCI, FTSE, S&P, and Sustainalytics where available. The engagement dummy in Panel B represents procedurally successful environmental or social shareholder proposals that pass the vote with a majority or are preventively adopted before a vote by firms from the Institutional Shareholder Services (ISS) database. The % Voted in favor of SRI in Panel C indicates the share of investors that voted in favor of environmental or social shareholder proposals retrieved from the ISS database (following He et al., 2023). The average portfolio holdings reflect the share of each investor type, as specified in the header, in firms' market capitalization relative to the total market capitalization, with equal weights across firms. Firm-clustered standard errors are given in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Panel A: ESG ratings and Portfolio tilting

VARIABLES	(1) Institutional	(2) PRI	(3) Non-PRI	(4) PRI AO	(5) PRI IM	(6) Institutional	(7) PRI	(8) Non-PRI	(9) PRI AO	(10) PRI IM
ESG rating	0.559***	0.293***	0.266***	0.005**	0.288***					
	(0.085)	(0.040)	(0.080)	(0.002)	(0.040)					
Aspirations						0.498***	0.386***	0.112	-0.003	0.386***
						(0.130)	(0.069)	(0.126)	(0.004)	(0.068)
Performance						-0.019	0.091	-0.110	-0.002	0.087
						(0.096)	(0.057)	(0.096)	(0.003)	(0.056)
Average portfolio holdings (%)	86.98	15.13	71.85	0.69	14.43	86.98	15.13	71.85	0.69	14.43
Observations	19,764	19,764	19,764	19,764	19,764	19,764	19,764	19,764	19,764	19,764
Adjusted R^2	0.868	0.833	0.839	0.763	0.831	0.868	0.833	0.838	0.763	0.831
Size	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 3 – continued

Panel B: Robustness successful SRI engagement

VARIABLES	(1) Institutional	(2) PRI	(3) Non-PRI	(4) PRI AO	(5) PRI IM	(6) Institutional	(7) PRI	(8) Non-PRI	(9) PRI AO	(10) PRI IM
ESG rating	0.597***	0.309***	0.288***	0.005**	0.303***					
	(0.086)	(0.041)	(0.082)	(0.002)	(0.041)					
Aspirations						0.492***	0.384***	0.108	-0.003	0.383***
						(0.131)	(0.070)	(0.128)	(0.004)	(0.069)
Performance						-0.019	0.089	-0.108	-0.001	0.086
						(0.097)	(0.058)	(0.097)	(0.004)	(0.057)
Successful SRI Engagement	2.538***	1.052***	1.486	0.042*	1.003***	-0.371	-0.437	0.066	0.050	-0.483
	(0.927)	(0.384)	(0.906)	(0.022)	(0.384)	(2.192)	(1.029)	(2.123)	(0.050)	(1.032)
Successful SRI Engagement X ESG rating	-0.734***	-0.296***	-0.438**	0.001	-0.292***					
	(0.175)	(0.078)	(0.170)	(0.004)	(0.077)					
Successful SRI Engagement X Aspirations						-0.038	0.010	-0.048	0.005	0.012
						(0.254)	(0.114)	(0.254)	(0.006)	(0.114)
Successful SRI Engagement X Performance						-0.064	0.013	-0.076	-0.010	0.015
						(0.247)	(0.116)	(0.235)	(0.006)	(0.117)
Average portfolio holdings (%)	86.98	15.13	71.85	0.69	14.43	86.98	15.13	71.85	0.69	14.43
Observations	19,764	19,764	19,764	19,764	19,764	19,764	19,764	19,764	19,764	19,764
Adjusted R^2	0.868	0.839	0.833	0.763	0.831	0.868	0.838	0.833	0.763	0.831
Size	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 3 – continued

Panel C: Robustness share of supportive votes SRI engagement

VARIABLES	(1) Institutional	(2) PRI	(3) Non-PRI	(4) PRI AO	(5) PRI IM	(6) Institutional	(7) PRI	(8) Non-PRI	(9) PRI AO	(10) PRI IM
ESG rating	0.564***	0.301***	0.263***	0.005**	0.296***					
	(0.086)	(0.041)	(0.081)	(0.002)	(0.040)					
Aspirations						0.490***	0.384***	0.106	-0.002	0.383***
						(0.131)	(0.070)	(0.127)	(0.004)	(0.069)
Performance						-0.024	0.090	-0.114	-0.002	0.088
						(0.097)	(0.057)	(0.096)	(0.003)	(0.056)
% Voted in favor SRI	0.003	0.029**	-0.026	0.001	0.028**	-0.062	-0.008	-0.054	0.002	-0.003
	(0.048)	(0.014)	(0.047)	(0.001)	(0.014)	(0.110)	(0.025)	(0.109)	(0.002)	(0.025)
% Voted in favor SRI X ESG rating	-0.008	-0.009***	0.001	-0.000	-0.009***					
	(0.008)	(0.003)	(0.008)	(0.000)	(0.003)					
% Voted in favor SRI X Aspirations						0.001	-0.001	0.002	-0.000	-0.000
						(0.012)	(0.003)	(0.012)	(0.000)	(0.003)
% Voted in favor SRI X Performance						0.005	-0.000	0.005	-0.000	-0.002
						(0.009)	(0.004)	(0.009)	(0.000)	(0.004)
Average portfolio holdings (%)	86.98	15.13	71.85	0.69	14.43	86.98	15.13	71.85	0.69	14.43
Observations	19,764	19,764	19,764	19,764	19,764	19,764	19,764	19,764	19,764	19,764
Adjusted R^2	0.868	0.839	0.833	0.763	0.831	0.868	0.838	0.833	0.763	0.831
Size	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 4: ESG ratings, sustainable aspirations, and sustainable performance

This table does an initial analysis on whether ESG ratings reflect early transition phase firms. We regress firms' raw sustainable aspiration and performance information for emissions, water use, human rights, and employee safety on their MSCI, FTSE, S&P, and Sustainalytics ESG ratings. We anticipate ESG ratings to be positively related to sustainable aspirations and negatively or not related to sustainable performance variables when higher-rated firms are early in their sustainable transition phase. Columns (1) through (4) use MSCI, FTSE, S&P, and Sustainalytics ratings as dependent variables, respectively. CO_2 emission policy, CO_2 emission targets, Water efficiency targets, Human rights policy, and Employee health safety team, are equal to 1 if firms adopt these issues or 0 when they do not. We scale CO_2 emissions, Water use, Human rights controversies, and Total accidents by total assets in millions and take the logarithm of one plus each variable. Firm-clustered standard errors are given in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively

VARIABLES	(1) MSCI	(2) FTSE	(3) S&P	(4) Sustainalytics
CO_2 emission policy	0.416***	0.099	-0.033	0.042*
	(0.119)	(0.061)	(0.040)	(0.023)
CO_2 emission targets	0.342***	0.221***	0.334***	0.110***
	(0.121)	(0.051)	(0.037)	(0.020)
CO_2 emissions	-0.013	-0.012	-0.021***	-0.001
	(0.024)	(0.011)	(0.007)	(0.004)
Water efficiency targets	0.171	0.384***	0.275***	0.092***
	(0.135)	(0.060)	(0.044)	(0.025)
Water use	-0.022	-0.025**	-0.034***	-0.008**
	(0.021)	(0.010)	(0.008)	(0.004)
Human rights policy	0.288**	0.086*	0.077**	0.029*
	(0.114)	(0.052)	(0.033)	(0.017)
Human rights controversies	0.286	-0.114	0.114	-0.197**
	(0.378)	(0.166)	(0.168)	(0.079)
Employee health safety team	0.104	0.158***	0.077**	-0.013
	(0.121)	(0.050)	(0.033)	(0.017)
Total accidents	-0.011	0.021	0.004	0.006
	(0.035)	(0.015)	(0.010)	(0.005)
Observations	5,353	22,527	26,781	27,657
Adjusted R-squared	0.653	0.780	0.800	0.885
Size	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES

Table 5: ESG ratings: A measure of sustainable aspirations or performance?

This table regresses firms' sustainable aspiration and performance scores on their MSCI, FTSE, S&P, and Sustainalytics ESG ratings to examine whether highly ESG-rated firms are in their sustainable transition phase. Columns (1) to (3), (4) to (6), (7) to (9), and (10) to (12) use MSCI, FTSE, S&P, and Sustainalytics ratings as dependent variables, respectively. Firm-clustered standard errors are given in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

	MSCI			FTSE			S&P			Sustainalytics		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Aspiration	0.538***	0.485***	0.157**	0.917***	0.575***	0.068***	0.713***	0.451***	0.082***	0.164***	0.139***	0.021***
	(0.034)	(0.041)	(0.066)	(0.025)	(0.023)	(0.018)	(0.018)	(0.015)	(0.013)	(0.011)	(0.011)	(0.006)
Performance	-0.034	-0.057	0.009	0.025	-0.069***	-0.035**	-0.093***	-0.043***	-0.021**	-0.051***	0.029***	-0.005
	(0.036)	(0.035)	(0.040)	(0.024)	(0.019)	(0.015)	(0.016)	(0.011)	(0.011)	(0.011)	(0.010)	(0.005)
Observations	7,507	7,507	7,507	22,797	22,797	22,797	27,688	27,688	27,688	28,297	28,297	28,297
Adjusted R-squared	0.082	0.232	0.647	0.181	0.500	0.777	0.186	0.497	0.796	0.026	0.311	0.884
Size	NO	YES	YES	NO	YES	YES	NO	YES	YES	NO	YES	YES
Industry FE	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES	NO
Country FE	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES	NO
Year FE	NO	YES	YES	NO	YES	YES	NO	YES	YES	NO	YES	YES
Firm FE	NO	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES

Table 6: The impact of portfolio tilting

This Table analyzes whether portfolio tilting by sustainable investors affects multiple indicators of tangible transition investments by firms. Panels A through D focus on firms transitioning their operations sustainably. Panel E analyzes firms that are already sustainable and firms that are unsustainable. In Panel A, we analyze the relationship between portfolio tilting and capital costs. Specifically, it examines the relationship between the cost of equity and the lagged share of PRI investors in a given firm ($PRI(\%)_{t-1}$, as defined before). Following Lee et al. (2021), we capture the cost of equity with the Chattopadhyay et al. (2022) firm-characteristic-based measure, the Gebhardt et al. (2001) implied cost of capital measure, and the Hou et al. (2012) fitted implied cost of capital model, with analyst forecasts from IBES, firm fundamentals from Compustat, and stock prices from CRSP and Compustat global. We follow Flammer (2021) and Van Binsbergen et al. (2010) and use weighted bond yields from WRDS bonds and interest expense over total assets from Compustat US and Global as measures for the cost of debt. In Panel B, we analyze the effect of (topic-specific) sustainable aspirations on one period-lagged portfolio tilting by sustainable investors. Columns (1) to (15) reflect all sustainable aspirations (1) and sustainable aspirations on green investments (2), greenhouse gas emissions (3), materials source management (4), supply chain management (5), water use (6), business ethics (7), customer welfare (8), legal & regulatory concerns (9), labor practices (10), waste management (11), privacy (12), selling practices (13), employee health safety (14), employee management (15) respectively. In Panel C, we investigate how research and development and patents are related to one period-lagged portfolio tilting. $\frac{R\&D}{Assets}$ in Column (1) captures firms' research and development expense over total assets expressed in percentages retrieved from Compustat North America and Global, converted to USD. We collect patent data from the United States Patent and Trademark Office, patent classification and citations from Patents View, and an indicator of climate change mitigation patents from the OECD classification of patents, following (Cohen et al., 2020b). Since we analyze log patent issuance, we interpret economic effect sizes in percentage changes rather than levels. Therefore, we refrain from reporting the standard deviations of such log variables. In Panel D, we replicate several of these analyses for sub-samples of firms in heavily and non-heavily polluting industries. We define heavily polluting industries as mining, construction, utilities, and (petrochemical) manufacturing. In Panel D, we perform several of the above analyses on a different sample of firms: those already sustainable (top 20% of sustainable performance) and unsustainable, non-transitioning firms (bottom 20% of aspirations and performance).

Panel A: Tilting and capital costs

VARIABLES	(1) Growth Rate	(2) Cost of Equity	(3) Chattopadhyay et al. (2022)	(4) Hou et al. (2012)	(5) Gebhardt et al. (2001)	(6) Cost of Debt	(7) Interest expense	(8) Bond yield
$PRI(\%)_{t-1}$	16.07** (6.54)	-2.18*** (0.83)	-3.10** (1.29)	-1.78*** (0.59)	0.00 (0.26)	-0.21 (0.57)	-0.46 (0.29)	-0.02 (0.67)
Dependent variable s.d.	21.26	2.28	5.34	2.37	1.83	1.28	1.73	1.90
Observations	6,080	4,423	7,566	4,908	7,222	4,268	8,716	4,447
Adjusted R-squared	0.11	0.60	0.45	0.76	0.83	0.76	0.71	0.70
Size	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES

Panel B: Tilting and future sustainable aspirations

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
$PRI(\%)_{t-1}$	1.34*** (0.18)	2.67*** (0.41)	2.03*** (0.49)	1.18*** (0.39)	2.26*** (0.59)	-0.20 (0.44)	3.87*** (0.53)	4.76*** (0.70)	1.24*** (0.47)	1.06** (0.43)	1.21*** (0.36)	1.49*** (0.43)	-0.49 (0.40)	4.59*** (0.65)	0.56 (0.39)
Dependent variable s.d.	1.59	2.99	3.43	3.30	3.50	4.99	2.24	3.56	3.03	3.24	3.55	2.36	2.50	4.01	2.49
Observations	10,500	10,500	10,500	10,500	10,500	10,500	10,500	10,500	10,500	10,500	10,500	10,500	10,500	10,500	10,500
Adjusted R-squared	0.75	0.72	0.73	0.63	0.68	0.70	0.60	0.67	0.72	0.47	0.76	0.76	0.63	0.63	0.58
Size	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 6 – continued

Panel C: Tilting and tangible innovation investments

VARIABLES	(1) ln(patents)	(2) ln(citations)	(3) ln(CC mitigation)	(4) ln(CC mitigation energy)	(5) ln(CC mitigation transportation)	(6) ln(CC mitigation buildings)
$PRI(\%)_{t-1}$	1.25**	2.29***	0.57**	0.26**	0.41**	0.23
	(0.49)	(0.72)	(0.24)	(0.12)	(0.17)	(0.19)
Observations	1,949	1,949	1,949	1,949	1,949	1,949
Adjusted R-squared	0.83	0.78	0.62	0.51	0.64	0.43
Size	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES

Panel D: Heavy Polluting VS Greener Industries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
			Heavy Polluting					**Less Polluting**		
VARIABLES	Cost of Equity	Cost of Debt	Aspirations	ln(patents)	ln(CC mitigation)	Cost of Equity	Cost of Debt	Aspirations	ln(patents)	ln(CC mitigation)
$PRI(\%)_{t-1}$	-3.21**	-1.56***	0.96***	0.15	1.74**	-1.69*	0.68	1.22***	1.51***	0.26
	(1.50)	(0.43)	(0.22)	(1.18)	(0.84)	(0.98)	(0.82)	(0.25)	(0.55)	(0.21)
Dependent variable s.d.	7.58	3.34	1.55	-	-	2.33	1.29	1.61	-	-
Observations	1,897	2,361	4,331	483	483	2,526	1,907	6,169	1,466	1,466
Adjusted R-squared	0.55	0.73	0.67	0.85	0.70	0.62	0.79	0.74	0.82	0.52
Size	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Panel E: Sustainable & Unsustainable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
			Sustainable					**Unsustainable**		
VARIABLES	Cost of Equity	Cost of Debt	Aspirations	ln(patents)	ln(CC mitigation)	Cost of Equity	Cost of Debt	Aspirations	ln(patents)	ln(CC mitigation)
$PRI(\%)_{t-1}$	0.24	-1.58	0.66	0.46	0.34	1.56	0.87	-1.49	3.59	0.25
	(2.31)	(2.00)	(0.52)	(0.93)	(0.42)	(3.39)	(2.40)	(0.95)	(2.62)	(1.43)
Dependent variable s.d.	7.58	3.34	1.55	-	-	2.33	1.29	1.61	-	-
Observations	480	264	1,790	338	338	378	195	782	55	55
Adjusted R-squared	0.71	0.74	0.80	0.82	0.71	0.67	0.83	0.72	0.82	0.16
Size	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 7: Sustainable aspirations and subsequent sustainable performance

This table regresses the past 15 years sustainable aspiration scores on sustainable performance scores. Each regression coefficient represents the parameter estimate of individual regressions of lagged aspiration scores on performance scores. Observations and adjusted R^2 represent the average over the 15 regressions in each Column. The dependent and independent variables for Column (1) are the sustainable performance and aspiration scores as before. The dependent and independent variables for the later Columns capture the sustainable performance and aspiration scores specific to 14 SASB categories. These capture green investments (2), greenhouse gas emissions (3), materials source management (4), supply chain management (5), water use (6), business ethics (7), customer welfare (8), legal and regulatory concerns (9), labor practices (10), waste management (11), privacy (12), selling practices (13), employee health safety (14), employee management (15). Firm-clustered standard errors are given in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

VARIABLES	All (1)	Green investments (2)	Greenhouse gas emissions (3)	Materials source management (4)	Supply chain management (5)	Water use (6)
$Aspirations_{i,t-1}$	0.05***	0.19***	0.06***	0.03***	-0.19***	0.07***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
$Aspirations_{i,t-2}$	0.04***	0.14***	0.04***	0.03***	-0.19***	0.06***
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
$Aspirations_{i,t-3}$	0.03***	0.08***	0.02***	0.04***	-0.14***	0.04***
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
$Aspirations_{i,t-4}$	0.01**	0.04***	0.01***	0.04***	-0.08***	0.02***
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
$Aspirations_{i,t-5}$	0.01	-0.00	0.01**	0.03***	-0.04***	0.01**
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
$Aspirations_{i,t-6}$	0.00	-0.02**	0.01*	0.01**	0.01	0.00
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
$Aspirations_{i,t-7}$	0.01	-0.04***	0.01	-0.01	0.05***	-0.01*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
$Aspirations_{i,t-8}$	0.00	-0.04***	-0.00	-0.01	0.07***	-0.01*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-9}$	0.01	-0.03***	0.01	-0.01*	0.09***	-0.01**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-10}$	0.01*	-0.02	0.02***	-0.01	0.08***	-0.01**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-11}$	0.01	-0.02	0.04***	-0.00	0.08***	-0.01**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-12}$	0.01	-0.02**	-0.00	0.00	0.08***	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-13}$	0.00	-0.03**	-0.03***	0.01	0.09***	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
$Aspirations_{i,t-14}$	-0.00	-0.03**	-0.04***	0.00	0.03*	-0.01*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
$Aspirations_{i,t-15}$	0.01	-0.01	-0.02*	0.00	0.01	-0.02*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.01)
Observations	24,115	24,115	24,115	24,115	24,115	24,115
Adjusted R^2	0.575	0.663	0.736	0.515	0.663	0.727
Size	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES

Table 7 – continued

VARIABLES	Business ethics (7)	Customer welfare (8)	Legal and regulatory concerns (9)	Labor practices (10)	Waste management (11)	Privacy (12)	Selling practices (13)	Employee health safety (14)	Employee management (15)
$Aspirations_{i,t-1}$	-0.02***	0.00	-0.03***	-0.01**	-0.00	0.00	0.01***	-0.01***	0.00
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Aspirations_{i,t-2}$	-0.02***	-0.00	-0.02***	-0.03***	0.00	-0.01*	0.01	-0.01**	0.00
	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Aspirations_{i,t-3}$	-0.03***	-0.00	-0.02***	-0.03***	0.00	-0.01***	0.00	-0.01**	0.00
	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Aspirations_{i,t-4}$	-0.00	0.00	-0.01	-0.02***	0.00	-0.01***	0.01*	-0.01***	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
$Aspirations_{i,t-5}$	-0.01	0.01	0.00	-0.02**	-0.00	-0.01***	0.01**	-0.01**	-0.01*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
$Aspirations_{i,t-6}$	-0.00	0.01*	0.00	-0.02**	-0.00	-0.01*	0.01**	-0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
$Aspirations_{i,t-7}$	0.00	0.02***	0.01	-0.01	-0.01**	-0.01**	-0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
$Aspirations_{i,t-8}$	0.00	0.03***	0.01	-0.01	-0.00	-0.02***	-0.01	0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
$Aspirations_{i,t-9}$	-0.01	0.02**	0.01	-0.01	-0.00	-0.02**	-0.02***	-0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
$Aspirations_{i,t-10}$	-0.01	0.01	0.00	0.01	-0.00	0.00	-0.03***	0.01	-0.01
	(0.02)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
$Aspirations_{i,t-11}$	-0.01	0.01	0.00	0.02*	-0.00	0.01	-0.02***	0.02***	-0.01
	(0.02)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
$Aspirations_{i,t-12}$	0.02	0.00	-0.00	0.02	-0.00	0.02	-0.03***	0.03***	-0.02***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
$Aspirations_{i,t-13}$	0.01	0.01	-0.01	-0.01	-0.00	0.00	-0.01	0.02***	-0.01
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-14}$	0.05**	0.02	-0.04***	0.01	-0.00	-0.00	-0.00	-0.00	-0.01
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-15}$	0.06**	0.03	-0.02	0.01	0.01	0.03	0.01	0.00	-0.02
	(0.03)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)
Observations	24,115	24,115	24,115	24,115	24,115	24,115	24,115	24,115	24,115
Adjusted R^2	0.333	0.393	0.599	0.235	0.800	0.180	0.460	0.583	0.518
Size	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Internet Appendix

Appendix A Variable compilation

In this Appendix, we describe how we treat raw LSEG ESG data to ensure the replicability of our work. We cannot directly use all granular LSEG ESG information because some variables are near empty, and others show overlap for similar data fields. As a first step, we remove variables with less than 500 observations (out of our 67,258 firm-year observations sample) to ensure variable relevance. For example, Revinitiv ESG provides both recent and standard ESG controversies. These current controversies often contain less than 50 observations. Therefore, we merge recent controversy data into the matching primary controversy variable regarding the health and safety of customers and customers in general, responsible marketing, product access, business ethics, management team compensation, intellectual property, responsible R&D, anti-competition, wage/working conditions, diversity, privacy, employee health and safety, critical countries, shareholder rights, insider trading, accounting, and tax fraud information.

Second, we also remove select emissions-related variables with less than 50 observations, like policies regarding the divestment of fossil fuel, indirect energy use, cement energy use, the supplied renewable energy, cement CO_2 emissions, internal carbon pricing, total hazardous waste revenue, water pollutant emissions revenue, fleet CO_2 emissions, and fuel consumption.

Third, we observe insufficient information regarding revenue from environmental products, equator principals or equator environmental projects, company cross-shareholding, supply chain health and safety impairments, abortifacients, drug delays, FDA warning letters, not approved drug, recent FDA warning letters, product delays, alcohol revenue, gambling revenue, tobacco revenue, armament revenue, employee resource groups, expanded constituency provisions, community lending and investment, the percentage of certified quality management systems and the production of cluster bombs, landmines and firearms, litigation expenses, fair price

provision, energy produced directly, unlimited authorised capital, carbon offsetting credits, advance notice period, written consent requirements, $\frac{non-audit}{audit\,fees}$, auditor tenure, golden parachute, water discharged total donations, earning restatement, profit warnings, ESM certificated (%), GMO products, iso 9k, training costs total, and HIV/aids programs.

Fourth, we do not consider shareholder rights in identifying sustainable performance or aspirations because this cannot be allocated to a SASB materiality group and does not fully align with ESG principles. For this reason, we omit shareholder rights policy, policy equal voting rights, policy shareholder engagement, different voting rights per share, equal shareholder rights, voting cap, voting cap (%), minimum number of shares to vote director election majority requirement, shareholder vote on executive positions, public availability corporate statement, veto power or golden shares, state-owned enterprise identifier, anti-takeover devices larger than two, percentage supermajority vote requirement, limited shareholder rights, elimination of cumulative voting, pre-emptive rights, confidential voting policy, limitation of director liability, shareholder approval significant, rules on the removal of a director, or advance notice for shareholder propositions from our analysis.

Last, we append information on multiple ESG variables that cover distinct parts of the sample for CO_2 emissions, VOC or PM emissions, water revenue/assets, hazardous waste, waste recycling (%), employee turnover, training and development policies, training hours, net employment creation, injury rates (and their attributed lost time), accidents, women employees, board diversity, environmental expenditures, environmental provisions, environmental supply chain management, environmental partnerships, renewable energy, animal testing, business ethics policies, business ethics controversies, and anticompetitive controversies. Using this approach, we retain 169 out of 466 variables; all allocated to SASB materiality groups and reporting, policies, protocols, targets, controversies, or performance.

The assignment of granular ESG aspects to policy, protocol, target, outcome, or controversy is critical for our study. To this end, we provide a detailed description of each variable

and the reason why we assign it to either ESG reporting, policy, protocol, target, outcome, or controversy categories, see Table A1. Protocols should be captured under sustainable aspirations rather than performance as they fit this description. Where potential other studies use data items such as flexible working hours as an outcome variable, our granular information enables us to measure more direct measures, such as employee satisfaction. In Table A2, we show five correlation matrices with a matched policy, protocol, and output variable on water use, health & safety, supply chain health & safety, fair marketing, and employee benefits (Panels A through E). For each of these aspects, the protocol is more strongly related to the outcome variable. For this reason, we capture protocols as aspiration. We replicated our method without aspirations and results remain unchanged.

Table A1: Granular ESG data classification

This table provides a more detailed explanation on how we classified the granular ESG information in our sample.

Variable name	ESG type	Explanation
Emission policy	Policy	This variable is policy as it captures whether a firm has a policy on reducing its emissions.
Emission trading	Protocol	This variable is a protocol as it captures whether firms are part of an emission trading scheme (ETS), participation in which is often mandatory by law and does not necessarily measure emission reductions (in and of itself, it would just be a regulatory cost). Therefore, we do not classify this protocol as a performance measure.
Emission targets	Target	This variable is a target as it indicates whether the firm has a target to reduce its CO_2 emissions.
Emission reduction target (%)	Target	This variable is a target as it indicates the level of CO_2 emission reduction targets firms have set in percentage terms. The variable is distinct from emission targets as it is more concrete.
CO_2 Emissions	Output	This variable is an output variable as it captures firms' Scope 1, Scope 2, and Scope 3 downstream and upstream emissions (where available).
Staff transportation impact reduction	Protocol	This variable is a protocol as it captures whether the company nudges staff to reduce their travel emissions, not whether employees actually reduce their emissions, which is captured in CO_2 Emissions directly.
Ozone-depleting substances	Output	This variable is an output variable as it captures how firms affect the ozone layer.
NO_x and SO_x Emissions	Output	This variable is an output variable as it directly captures firms' NO_x and SO_x emissions.
NO_x and SO_x Emission Reduction	Output	This variable is output as it captures the first difference in firms' NO_x and SO_x emissions.
VOC and PM Emissions	Output	This variable is an output variable that directly captures firms' VOC and PM emissions.
VOC and PM Emission reduction	Output	This variable is an output variable as it captures the first difference in firms' VOC and PM emissions.
Energy efficiency policy	Policy	This variable is a policy as it captures whether firms have policies on energy efficiency.
Energy efficiency targets	Target	This variable is a target as it captures whether firms have targets on energy efficiency.
Renewable energy ratio	Output	This variable is an output variable as it captures firms' direct use of fossil and renewable energy.
Water efficiency policy	Policy	This variable is a policy as it captures whether firms have policies to reduce water use.
Water Technologies	Protocol	This variable is a protocol as it captures whether firms invest in technologies to reduce water use. It is not performance as is because firms have yet to materialize these technological advances into water use reductions.
Water efficiency targets	Target	This variable is a target as it captures whether firms have targets to reduce their water use.
Water usage	Output	This variable is an output variable as it captures the actual water use of firms.
Water recycled	Output	This variable is an output variable that captures the amount of water firms recycle from their operations.
Water pollutant emissions	Output	This variable is an output variable as it captures how much firms pollute in water streams.
Waste reduction initiatives	Protocol	This variable is a protocol as it captures whether firms have initiatives to reduce waste. These protocols are not always successful and do not capture whether firms actually reduce their total waste.
Waste	Output	This variable is an output variable as it captures firms' waste.
Waste recycled (%)	Output	This variable is output as it captures the share of waste that firms manage to recycle, materially affecting their environmental footprint.
Hazardous waste	Output	This variable is an output variable that captures how much hazardous waste firms produce.
Toxic chemicals reduction	Output	This variable is an output variable as it captures the first difference in firms' toxic pollution.
Electronic waste reduction	Output	This variable is an output variable as it captures how much electronic waste firms create.
Environmental restoration initiatives	Protocol	This variable is a protocol as it captures whether firms have initiatives to further environmental restoration. The variable does not capture the scope of these initiatives nor the firm's impact on environmental restoration or biodiversity-related issues.
Land environmental impact reduction	Policy	This variable is a policy as it captures whether the firm has a policy on reducing its environmental impact. Not whether firms actually improve their environmental impact.
Biodiversity impact reduction	Policy	This variable is a policy as it captures whether the firm has a policy on reducing its biodiversity impact. Not whether firms actually improve their biodiversity impact.
Policy Human Rights	Policy	This variable is a policy as it captures whether firms have a policy on human rights.
Policy Community involvement	Policy	This variable is a policy as it captures whether firms have policies on their community involvement.
Human rights compliance ILO/UN	Policy	This variable is a policy as it captures whether the company complies with the United Nations human rights standard. It does not consider whether the company has human rights controversies or its outputs on human rights.
Donations	Output	This variable is an output variable as it captures the actual donations and lobbying expenses of firms.
Controversies privacy	Controversy	This variable is a controversy as it captures whether the firm has controversies on privacy of its customers.
Policy data privacy	Policy	This variable is a policy as it captures whether the firm has a policy to protect the privacy and data of its customers.
Whistle-blower protection	Policy	This variable is a policy as it indicates whether firms have policies on whistle-blower protection. Not whether firms actually protect whistle-blowers.
HSMS certified percent	Policy	This variable is a policy as it captures to what extent the firms' operations are Health and Safety Management System certified. It does not capture the amount of health and safety concerns or outputs a firm has on this topic.

Continued

Table A1 – continued

Variable name	ESG type	Explanation
Product discount emerging markets	Protocol	This variable is a protocol as it captures whether firms offer products at a discount for emerging markets. This is particularly pronounced for pharmaceutical companies. The variables are a protocol, not performance, as it does not signify the number of countries goods are being sold to at a discount, the quantity of goods sold at a discount, nor the price discount in percentages. It could simply be that the firm is optimally setting its price at a lower rate for solely profit-optimizing reasons.
Product access low prices	Protocol	This variable is a protocol as it captures whether the firm offers cheap products. This variable is a protocol as it is distinct from customer satisfaction or customer health. Cheap products are not always beneficial, nor produced at the expense of profits.
Policy customer health safety	Policy	This variable is a policy as it captures whether a firm has a policy on customer health and safety.
Product recall	Output	This variable is an output variable as it captures whether the firm makes sound products or has to recall a share of its goods that are defective. This is a direct indicator of product quality and internal safety checks, and hence, an output.
Product responsibility monitoring	Protocol	This variable is a protocol as it captures whether the firm monitors the responsibility of its products. It is more intensive than a policy as it requires concrete action but less impactful than performance since monitoring does not require acting on this.
Healthy food/products	Protocol	This variable is a protocol as it captures whether the firm has products classified as healthy products. It does not tell the share of healthy products to revenue nor the pricing of these products relative to conventional alternatives.
Controversies consumer complaints	Controversy	This variable is a controversy variable as it captures direct consumer-related controversies.
Policy responsible marketing	Policy	This variable is a policy as it captures firms' policies on responsible marketing.
Policy fair trade	Policy	This variable is a policy as it captures firms' policies on fair trade products.
Retailing responsibilities	Protocol	This variable is a protocol as it captures whether firms engage in retail responsibilities. It does not quantify the impact of these protocols, the inventive margin, nor the consequences on consumers.
Ethical trading initiatives	Policy	This variable is a policy as it captures firms' stance on ethical trading initiatives rather than their actual trading behavior (captured in selling products at a discount to developing markets).
Customer satisfaction	Output	This variable is an output variable as it captures how satisfied customers are with products. This is a direct consequence of the trading initiatives, responsible marketing, and the products offered by the firm as listed above.
Controversies wages working conditions	Controversy	This variable is a controversy as it captures controversies about firms not paying their employees a living wage.
Policy child labor	Policy	This variable is a policy as it captures whether firms have a policy on child labor.
Policy forced labor	Policy	This variable is a policy as it captures whether firms have a policy on forced labor.
Policy training and development	Policy	This variable is a policy as it captures whether firms have a policy on training their employees.
Day care service	Protocol	This variable is a protocol as it captures whether the company has daycare. We do not classify this as performance as it does not disclose the amount of daycare that is available to employees at all ranks and the associated costs of using the service. Hence, we cannot reasonably assess its impact on employee benefits.
Employee engagement voluntary work	Policy	This variable is a policy as it captures whether firms have a policy on voluntary work by employees.
Training hours	Output	This variable is an output variable as it captures the number of training hours. This variable follows up on the policy on training and development.
Employee fatalities / assets	Output	This variable is an output variable as it captures how many people die in service of the firm, scale adjusted. There is probably no more direct measure of health and safety concerns available than this.
Flexible working hours	Protocol	This variable is a protocol as it captures whether the firm has flexible working hours for some of its employees. It does not capture the scope of these working hours nor the extent to which employees have autonomy over their schedule.
Employee satisfaction	Output	This variable is an output variable as it captures how happy employees are with their jobs.
Salaries/wages	Output	This variable is an output variable as it captures the wages of employees.
Net employment creation / assets	Output	This variable is an output variable as it captures how many jobs the firm creates. Net employment creation is good for current workers, all else equal, as the firm is growing and needs more managers and good for external workers as they have better outside options, increasing their internal bargaining power.
Employee turnover	Output	This variable is an output variable as it captures employee discontent.
Strikes	Controversy	This variable is a controversy as it captures whether employees en-masse voice their disagreement with the firm and stop working.
Health safety policy	Policy	This variable is a policy as it captures whether firms have a health and safety policy.
Employee health safety team	Protocol	This variable is a protocol as it captures whether firms hire staff to improve health and safety. It does not capture whether this help is effective.
Health safety training	Protocol	This variable is a protocol as it captures whether the company hosts trainings to promote health and safety. It does not capture whether these trainings are effective.
Accidents Total	Output	This variable is output as it captures how many health and safety-related indicators firms have.
Injury rate	Output	This variable is an output variable as it captures the share of workers that get injured every year.
Occupational diseases	Output	This variable is output as it captures whether the firm's employees have occupational diseases directly affecting their health.
Policy board diversity	Policy	This variable is a policy as it captures whether the firm has a policy on diversity in the board of directors.
Policy diversity and opportunity	Policy	This variable is a policy as it captures whether the firm has a policy on Diversity, Equity, and Inclusion (DEI).
Internal promotion	Protocol	This variable is a protocol as it captures whether the firm internally promotes (some) workers. It is not a performance measure as it does not display the rate of such internal proportions, and we have already captured employee wages, employee satisfaction, and strikes.

Continued

Table A1 – continued

Variable name	ESG type	Explanation
HRC corporate equality index	Output	This variable is output as it captures the extent to which firms perform on the Human Rights Campaign (HRC) corporate equality index. The higher the score, the better for LBTQ+ communities.
Targets diversity and opportunity	Target	This variable is a target as it captures firms' aspirations on DEI concerns formulated in explicit numerical terms.
Salary gap (%)	Output	This variable is an output variable as it captures the difference in wage between men and women.
Women employees	Output	This variable is an output variable as it captures the share of female employees. Admittedly, it is a bit hard to directly investigate this variable in terms of gender equality as a higher percentage of women in certain (high-wage) sectors/firms would be beneficial, whereas a higher share in less well-paying industries would be negative. As our comparison is within the industry, we take the perspective that a higher share of women's participation is positive from the perspective of better labor conditions and workforce participation.
Employees with disabilities	Output	This variable is an output variable as it captures the share of employees with disabilities, enabling them to enter the labor force.
Sustainable packaging policy	Policy	This variable is a policy as it captures whether the firm has a policy on sustainable packaging.
Take-back and recycling initiatives	Protocol	This variable is a protocol as it captures whether the firm has recycling and take-back initiatives. It does not capture the extent of these initiatives and the amount of product waste by consumers post-take-back.
Environmental Material Sourcing	Protocol	This variable is a protocol that captures whether firms consider material sources in the decision-making process. It does not directly capture the actual material use of firms
Environmental products	Protocol	This variable is a protocol as it captures whether firms have environmentally friendly products. It is no output variable as it does not capture the actual pollution of firms, as reflected in other variables.
Eco-design products	Protocol	This variable is a protocol as it captures whether firms have ecologically friendly products. It is no output variable as it does not capture the actual pollution of firms, as reflected in other variables
Renewable energy products	Protocol	This variable is a protocol as it captures whether the firm sells products related to renewable energy rather than the amount of these products they sell and the amount of renewable (or ratio of renewable) energy they use.
Sustainable building products	Protocol	This variable is a protocol as it captures whether the firm sells products related to sustainable buildings rather than the impact of these products in social and environmental dimensions.
Product impact minimization	Protocol	This variable is a protocol as it captures whether some products sold by the firm strive to have minimal environmental impact. This is classified as a protocol because it does not capture the actual environmental impact (reflected in other variables).
Product environmental responsibilities	Protocol	This variable is a protocol as it captures whether products are environmentally responsible. It is more tangible than a policy but not as impactful as the actual emissions of products or the firms' energy use as captured in other variables.
Environment management team	Policy	This variable is a policy as it captures whether firms have environmental management teams. It does not capture the impact of these teams on the firm.
CSR sustainability committee	Policy	This variable is a policy as it captures whether the firm had a committee on CSR. It does not indicate whether this committee has any power over the firms and is no direct output measure.
Global compact signatory	Reporting	This variable is a reporting variable as it captures whether the firm reports following the global compact signatory
Sustainability compensation executives	Protocol	This variable is a protocol as it captures whether executives receive compensation on sustainability-related topics. It is no performance measure as the outcomes of this compensation nor the difficulty of attaining them are not given.
Integrated strategy in MDA	Policy	This variable is a policy as it captures whether ESG concerns are mentioned in the annual meeting reports of firms in the management discussion.
Environmental project financing	Protocol	This variable is a protocol as it captures whether the firm finances environmental projects, not how much they do so and what the outcomes are.
Environment management training	Policy	This variable is a policy as it captures whether the firm's management receives training on environmental issues.
Green buildings	Output	This variable is an output variable as it captures whether firms have green buildings (e.g., LEED-certified)
Environmental investment initiatives	Protocol	This variable is a protocol as it captures whether firms have environmental investment initiatives, not how much they invest and what the outcomes are of these investments.
Six Sigma and Quality Management System	Policy	This variable is a policy as it captures whether the firm adopts a Six Sigma policy throughout its organization.
Environmental provisions / assets	Protocol	This variable is a protocol as it captures the buffers firms set aside for environmental harm or climate change damages. This is more an indication of their exposure than their performance on climate-related issues.
Environmental expenditures / assets	Output	This variable is an output variable as it captures the direct expenditures firms incur on environmental issues.
Environmental investment expenditures	Output	This variable is an output variable as it captures the direct investments firms make on environmental issues.
Environmental partnership	Protocol	This variable is a protocol as it captures whether firms have partnerships on environmental concerns, not whether these partnerships reduce emissions or lead to higher environmental investments.
Contractor human rights breaches	Output	This variable is an output variable as it captures whether firms' contractors face human rights breaches.
Human rights contractors	Protocol	This variable is a protocol as it captures whether the firm checks contractors on their human rights efforts.
Supplier ESG training	Protocol	This variable is a protocol as it captures whether firms train their suppliers, not the outcomes of this process.
Environmental supply chain policy	Policy	This variable is a policy as it captures whether the firm has a policy on environmental issues in the supply chain.
Environmental supply chain management	Policy	This variable is a policy as it captures whether the firm has a policy on managing environmental issues in the supply chain.

Continued

Table A1 – continued

Variable name	ESG type	Explanation
Policy supply chain health safety	Policy	This variable is a policy as it captures whether the firm has a policy on health and safety issues of employees in the supply chain.
Lost time injury rate contractors (%)	Output	This variable is an output variable as it captures the severity of health and safety concerns for their contractors.
Resource reduction policy	Policy	This variable is a policy as it captures a policy on whether firms reduce their resource use, not their actual resource use.
Organic product initiatives	Protocol	This variable is a protocol as it captures whether the firm has organic products, not how much it sells of this, the price, nor whether there are consumer health consequences.
Resource reduction targets	Target	This variable is a target as it captures whether firms reduce their resource use, not their actual resource use.
Energy usage	Output	This variable is an output variable as it captures firms' energy use.
Renewable energy usage	Output	This variable is output as it captures the share of renewable energy firms use. Scope 2 emissions matter for total carbon use, so this is critical.
Climate change commercial risk	Controversy	This variable is a controversy variable as it captures commercial risks associated with climate change.
Controversies tax fraud	Controversy	This variable is a controversy as it captures firms' tax fraud.
Controversies business ethics	Controversy	This variable is a controversy as it captures controversies in firms' business ethics.
Controversy bribery corruption and fraud	Controversy	This variable is a controversy as it captures controversies related to bribery, corruption, and fraud.
Controversies intellectual property	Controversy	This variable is a controversy as it captures controversies on intellectual properties.
Policy bribery and corruption	Policy	This variable is a policy as it captures policies on bribery and corruption.
Policy business ethics	Policy	This variable is a policy as it captures policies on business ethics.
Animal testing	Protocol	This variable is a protocol as it captures whether firms are complicit in testing products on animals. It is not a performance measure as it does not quantify how much animals are used and whether the process is cruel or harmful to them.
Policy fair competition	Policy	This variable is a policy as it captures firms' fair competition policies.
Trade union representation	Protocol	This variable is a protocol as it captures whether firms have trade union representations in any shape or form. It is a protocol as being in a union does not necessarily affect labor rights and wages.
Poison Pill	Controversy	This variable is a controversial variable as it captures takeover defense mechanisms, a corporate governance practice instigating agency concerns between management and its stakeholders.
Quality management systems	Policy	This variable is a policy as it captures whether firms have quality management systems.
OECD guidelines for multinationals	Policy	This variable is a policy as it captures whether firms have a policy to follow OECD guidelines for multinationals
Stakeholder engagement	Protocol	This variable is a protocol as it captures whether firms take with their stakeholders. It does not explain whether this has any consequence on its operations or sustainable performance.
Real estate sustainability certificate	Policy	This variable is a policy as it captures whether firms apply for sustainable real estate certificates.
Corporate responsibility awards	Output	This variable is an output variable as it captures whether firms receive awards for their CSR efforts.
Self-reported environmental fines	Output	This variable is an output variable as it captures whether firms experience environmental fines.
Accounting controversies	Controversy	This variable is a controversy variable as it captures whether firms experience accounting controversies.
Crisis management systems	Policy	This variable is a policy as it captures whether firms have a policy on crisis management systems.
Controversies public health	Controversy	This variable is a controversy variable as it captures public health controversies.
Accidental spills	Controversy	This variable is a controversy variable as it captures whether firms have oil spills.
Environmental controversies	Controversy	This variable is a controversy variable as it captures environmental controversies.
Controversies anti-competition	Controversy	This variable is a controversy variable as it captures anti-competitive pressure controversies.
Controversies responsible marketing	Controversy	This variable is a controversy variable as it captures whether firms have responsible marketing controversies.
Obesity risk	Controversy	This variable is a controversy variable as it captures whether firms experience controversies on obesity and unhealthy food.
Controversies product quality	Controversy	This variable is a controversy variable as it captures whether firms have controversies on product quality.
Controversies customer health	Controversy	This variable is a controversy variable as it captures whether firms have controversies on customer health.
ESG reporting scope	Reporting	This variable is a reporting variable as it captures the breath firms report on in terms of ESG
GRI reporting guidelines	Reporting	This variable is a reporting variable as it captures whether firms report using the Global Reporting Initiative framework.
Global CSR sustainability report	Reporting	This variable is a reporting variable as it captures whether firms issue a CSR/ESG/sustainability report.
CSR sustainability external audit	Reporting	This variable is a reporting variable as it captures whether firms get (part of) their CSR report audited.
Global compact signatory	Reporting	This variable is a reporting variable as it captures whether firms report in accordance with the global compact signatory.

Table A2: Correlations Policies, Protocols, and Outcomes

This Table correlated a protocol variable with a policy and an outcome variable for five dimensions of ESG, namely water use, health & safety, supply chain health & safety, fair marketing, and employee benefits (Panels A through E). For each of these aspects, the protocol is more strongly related to the outcome variable, indicating they should be classified with aspirations rather than performance.

Panel A: Water use

	Water efficiency policy	Water technologies	Water usage / assets
Water efficiency policy	1.000		
Water technologies	0.120***	1.000	
Water usage / assets	-0.006	-0.003	1.000

Panel B: Health & Safety

	Policy Employee Health Safety	Employee health safety team	Total Injury Rate Total
Policy Employee Health Safety	1.000		
Employee health safety team	0.486***	1.000	
Total Injury Rate Total	-0.036***	-0.037***	1.000

Panel C: Supply Chain Health & Safety

	Policy supply chain health safety	Supply Chain Health Safety Training	Contractor human rights breaches
Policy supply chain health safety	1.000		
Supply Chain Health Safety Training	0.545***	1.000	
Contractor human rights breaches	0.412***	0.316***	1.000

Panel D: Fair Marketing

	Policy responsible marketing	Retailing responsibilities	Customer satisfaction
Policy responsible marketing	1.000		
Retailing responsibilities	0.106***	1.000	
Customer satisfaction	0.005	0.001	1.000

Panel E: Employee benefits

	Policy training and development	Flexible working hours	Employee satisfaction
Policy training and development	1.000		
Flexible working hours	0.317***	1.000	
Employee satisfaction	0.004	-0.039***	1.000

Appendix B Addressing LSEG back-filing

Our paper uses LSEG ESG information to estimate sustainable aspiration and performance scores. We use this data as only LSEG offers the granularity in ESG variables required for our analysis (the second most granular ESG data originates from MSCI with less than a third of the variables).

However, LSEG ESG ratings have recently been under attack by Berg et al. (2020) for backfiling concerns. Berg et al. (2020) show that LSEG back-fills its ESG rating methodology to predict past financial performance artificially. Such back-filing poses a serious concern to any research that uses LSEG *ratings* to study investor behavior as the ratings available to researchers now diverge from those available to investors historically and potentially from researchers in the future. Consequently, we refrain from using LSEG *ESG ratings*.

LSEG does not back-fill their underlying ESG information, the data we rely upon, as investors primarily use their ratings to construct portfolios. Particularly, most of the data collected by LSEG is from public sources and is already available to investors through other mediums, such as ESG reports of firms, governmental reporting requirements, and news coverage. In their analysis, Berg et al. (2020) show that CO_2 data changed around the methodology improvement announced by LSEG in April 2020. They attribute this to enhanced measurement, solely affecting 6% of the data.

To put the reader more at ease that backfiling does not drive our results, we have updated the dataset in our paper and found similar results. The most direct test that backfiling does not affect our findings is using a more recent dataset and observing the same results. To this end, we have replicated the entire paper using data downloaded in May 2021 instead of the current May 2023 sample. Our results are comparable using either sample. This does not necessarily rule out the possibility of backfiling but at least shows that if backfiling occurs in granular LSEG ESG information, it does so in ways unrelated to investors' portfolio tilting.

Second, we find that our sustainable aspiration and performance scores are associated with environmental information reported by the EPA. If LSEG ESG is backfilled in ways that do not match firms' sustainable performance but introduce random noise or solely match financial performance, we would expect our measures based on this data to be unrelated to externally

validated toxic release data. On the contrary, we find a strong and persistent effect between our scores and EPA toxic releases by heavy polluters.

Last, we observe that the LSEG-based sustainable aspiration scores explain MSCI, FTSE, S&P, and Sustainalytics ESG ratings. If the data was uninformatively backfilled to match financial performance, we could not expect to observe this. Given the above, we argue that the backfiling of LSEG ESG ratings reported in Berg et al. (2020) is unlikely to play a significant role in our empirical application without diminishing the importance of their findings.

Appendix C Rank ordering robustness checks

This appendix shows that a non-parametric rank-ordering technique reasonably estimates sustainable performance and aspirations. As sustainable performance and aspirations scores are critical throughout our paper, it is paramount that we accurately aggregate the multi-dimensional LSEG ESG data. Therefore, we provide the reader with some validation analysis. First, we show that sustainable performance and aspiration scores are continuous measures. Subsequently, we show that these measures strongly correlate with their underlying information.

Figures C1 and C2 display the distribution of our industry-specific sustainable performance and aspiration scores. As anticipated, sustainable performance and aspiration scores are relatively normally distributed. Moreover, the scores generally have lower variance, indicating that they effectively smooth the multidimensionality of ESG. In line with a data generation process that partially relies on whether firms are in countries that require reporting or publish sustainability reports, one in thirty firms has sustainable aspiration scores of 0, indicating that some do not report extensively on ESG. These distributional forms show that our method can turn multiple partially discrete ESG data into continuous sustainable aspiration and performance scores.

In a second analysis, we show that sustainable performance and aspiration scores accurately capture their respective underlying granular ESG information. Tables C1 and C2 show two correlation matrices of sustainable aspiration and performance scores and the underlying granular sustainable performance indicators. Table C1 shows a persistently positive correlation between our aspiration scores and its underlying granular ESG variables. This provides the first sign of internal validity. This granular sustainable aspiration information is often more closely related to its respective sub-ESG score than to the overarching aspiration scores, indicating further internal validity.

In Table C2, we perform a similar analysis for sustainable performance scores with similar results. Sustainable performance scores are often positively related to the societally beneficial underlying granular ESG information and negatively associated with societally harmful activities. To illustrate, performance scores decline with strikes and improve with employee satisfaction. This effect persists across ESG output and controversy sub-scores. Like sustain-

able aspiration scores, output and controversy variables better explain their sub-scores than sustainable performance scores.

Figure C1: Density of sustainable performance scores

Figure C1 displays the density function of sustainable performance scores. The x-axis represents the performance scores of firms as computed in Equations (1) and (2). The y-axis the frequency of firms with such scores.

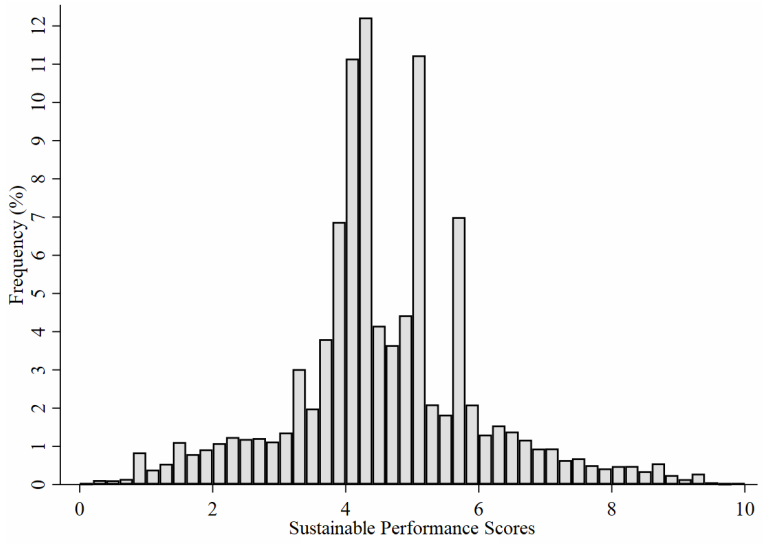

Figure C2: Density of sustainable aspiration scores

Figure C2 displays the density function of sustainable aspiration scores. The x-axis represents the aspiration scores of firms as computed in Equations (1) and (2). The y-axis the frequency of firms with such scores.

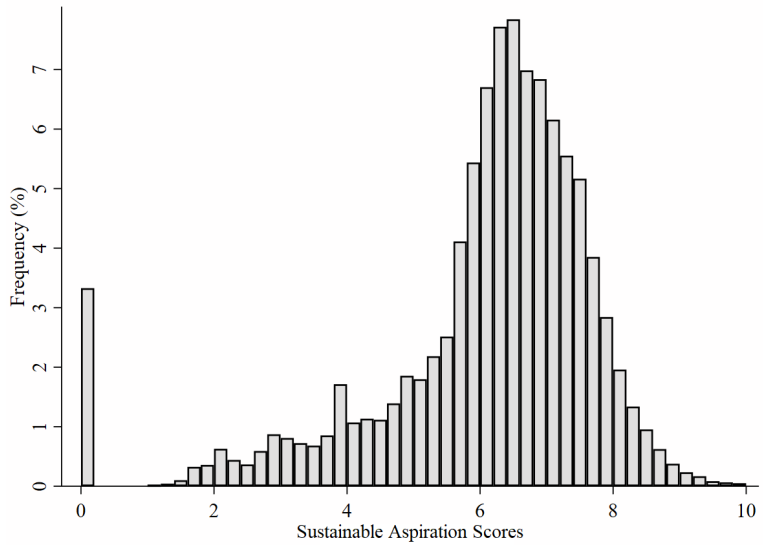

Table C1: Correlation matrix of sustainable aspiration scores to granular ESG variables

This table provides a correlation matrix on the sustainable aspiration scores and reporting, policy, target, and protocol sub-scores on granular sustainable aspiration information from LSEG ESG. To conserve space, exact p-values have been compressed, and only significance 10%, 5%, and 1% levels are denoted with respectively *, **, and ***.

Granular ESG variable	Aspirations	Reporting	Policy	Target	Protocol
Emission policy	0.574***	0.640***	0.584***	0.502***	0.596***
Emission trading	0.223***	0.269***	0.223***	0.282***	0.261***
Emission targets	0.435***	0.535***	0.455***	0.825***	0.470***
Emission reduction target (%)	0.227***	0.302***	0.248***	0.443***	0.211***
Staff transportation impact reduction	0.241***	0.280***	0.258***	0.206***	0.317***
Energy efficiency policy	0.580***	0.633***	0.600***	0.459***	0.598***
Energy efficiency targets	0.316***	0.393***	0.338***	0.738***	0.353***
Water efficiency policy	0.505***	0.570***	0.559***	0.448***	0.513***
Water technologies	0.156***	0.139***	0.138***	0.148***	0.210***
Water efficiency targets	0.293***	0.360***	0.334***	0.622***	0.310***
Waste reduction initiatives	0.564***	0.604***	0.563***	0.453***	0.620***
Environmental restoration initiatives	0.467***	0.487***	0.460***	0.403***	0.528***
Land environmental impact reduction	0.181***	0.187***	0.166***	0.145***	0.176***
Biodiversity impact reduction	0.369***	0.428***	0.392***	0.391***	0.365***
Policy human rights	0.518***	0.525***	0.607***	0.368***	0.515***
Policy Community involvement	0.509***	0.388***	0.489***	0.222***	0.542***
Human rights compliance ILO/UN	0.359***	0.447***	0.438***	0.378***	0.377***
Policy data privacy	0.328***	0.128***	0.421***	0.108***	0.217***
Whistleblower protection	0.300***	0.060***	0.382***	0.077***	0.160***
HSMS certified	0.160***	0.190***	0.222***	0.153***	0.142***
Product discount emerging markets	0.065***	0.080***	0.085***	0.087***	0.076***
Product access low prices	0.143***	0.164***	0.162***	0.150***	0.167***
Policy customer health safety	0.350***	0.324***	0.438***	0.318***	0.378***
Product responsibility monitoring	0.252***	0.278***	0.297***	0.260***	0.309***
Healthy food/products	0.185***	0.145***	0.196***	0.166***	0.199***
Policy responsible marketing	0.120***	0.112***	0.158***	0.114***	0.105***
Policy fair trade	0.081***	0.075***	0.120***	0.099***	0.087***
Retailing responsibilities	0.055***	0.023***	0.055***	0.025***	0.074***
Ethical trading initiatives	0.035***	0.033***	0.042***	0.040***	0.044***
Policy child labour	0.419***	0.422***	0.533***	0.295***	0.388***
Policy forced labour	0.406***	0.391***	0.521***	0.274***	0.369***
Policy training and development	0.526***	0.463***	0.552***	0.274***	0.526***
Day care service	0.250***	0.273***	0.292***	0.251***	0.323***
Employee engagement voluntary work	0.470***	0.361***	0.463***	0.290***	0.546***
Flexible working hours	0.348***	0.328***	0.384***	0.308***	0.426***
Health safety policy	0.567***	0.392***	0.579***	0.235***	0.515***
Employee health safety team	0.493***	0.501***	0.563***	0.362***	0.502***
Health safety training	0.550***	0.489***	0.554***	0.315***	0.601***
Policy board diversity	0.276***	0.127***	0.343***	0.090***	0.107***
Policy diversity and opportunity	0.493***	0.316***	0.555***	0.224***	0.410***
Internal promotion	0.316***	0.305***	0.330***	0.206***	0.355***
Targets diversity and opportunity	0.262***	0.305***	0.315***	0.412***	0.283***
Sustainable packaging policy	0.268***	0.297***	0.344***	0.310***	0.316***
Takeback and recycling initiatives	0.192***	0.234***	0.232***	0.269***	0.281***
Environment material sourcing	0.024***	0.031***	0.028***	0.007*	0.024***
Environmental products	0.340***	0.353***	0.324***	0.350***	0.391***
Eco-design products	0.215***	0.239***	0.240***	0.267***	0.305***
Renewable energy products	0.145***	0.217***	0.166***	0.179***	0.162***
Sustainable building products	0.156***	0.146***	0.133***	0.155***	0.200***
Product impact minimisation	0.231***	0.223***	0.208***	0.229***	0.363***
Product environmental responsibilities	0.419***	0.413***	0.378***	0.380***	0.532***
Environment management team	0.063***	0.076***	0.072***	0.067***	0.060***
CSR sustainability committee	0.510***	0.593***	0.533***	0.478***	0.530***
Global compact signatory	0.275***	0.499***	0.303***	0.343***	0.296***
Sustainability compensation executives	0.237***	0.208***	0.226***	0.190***	0.231***
Integrated strategy in MDA	0.203***	0.228***	0.214***	0.118***	0.186***
environmental project financing	0.485***	0.560***	0.546***	0.490***	0.540***
Environment management training	0.025***	0.039***	0.025***	0.040***	0.034***
Environmental investment initiatives	0.031***	0.025***	0.015***	0.040***	0.035***
Six sigma and quality management system	0.191***	0.151***	0.235***	0.140***	0.189***
Environmental provisions/ assets	0.078***	0.088***	0.097***	0.033***	0.074***
Environmental partnership	0.028***	0.029***	0.043***	0.057***	0.056***
Human rights contractors	0.444***	0.453***	0.549***	0.388***	0.469***

Continues on next page

Table C1 – continued

Granular ESG variable	Aspirations	Reporting	Policy	Target	Protocol
Supplier ESG training	0.313***	0.340***	0.402***	0.320***	0.349***
Environmental supply chain policy	0.498***	0.574***	0.576***	0.491***	0.538***
Environmental supply chain management	0.031***	0.039***	0.044***	0.047***	0.047***
Policy supply chain health safety	0.404***	0.390***	0.525***	0.357***	0.407***
Contractor accidents	0.071***	0.098***	0.077***	0.074***	0.069***
Contractor fatalities	0.096***	0.127***	0.103***	0.104***	0.092***
Contractors injury rate (%)	0.071***	0.086***	0.072***	0.056***	0.062***
Contractor lost time working days	0.032***	0.046***	0.038***	0.026***	0.031***
Resource reduction policy	0.638***	0.592***	0.597***	0.406***	0.645***
Organic product initiatives	0.143***	0.123***	0.149***	0.148***	0.145***
Resource reduction targets	0.366***	0.453***	0.395***	0.814***	0.400***
Policy bribery and corruption	0.378***	0.146***	0.464***	0.127***	0.236***
Policy business ethics	0.356***	0.116***	0.438***	0.114***	0.218***
Large or small board size	0.028***	0.095***	0.017***	0.122***	0.071***
Animal testing	-0.017***	-0.027***	0.037***	0.029***	-0.074***
Policy fair competition	0.301***	0.079***	0.390***	0.128***	0.173***
Trade union representation	0.014***	0.018***	0.014***	0.011***	0.017***
Quality management systems	0.287***	0.285***	0.323***	0.204***	0.302***
OECD guidelines for multinationals	0.181***	0.246***	0.226***	0.222***	0.193***
Stakeholder engagement	0.474***	0.653***	0.510***	0.465***	0.487***
Real estate sustainability certificate	0.135***	0.101***	0.106***	0.057***	0.088***
Crisis management systems	0.359***	0.351***	0.423***	0.253***	0.340***
CSR sustainability reporting	0.602***	0.888***	0.582***	0.497***	0.613***
GRI reporting guidelines	0.466***	0.752***	0.499***	0.502***	0.496***
Global CSR sustainability report	0.552***	0.847***	0.531***	0.432***	0.542***
CSR sustainability external audit	0.372***	0.631***	0.418***	0.499***	0.416***
External CSR audit	0.372***	0.631***	0.418***	0.499***	0.416***
ESG reporting scope	0.539***	0.850***	0.526***	0.389***	0.511***

Table C2: Correlation matrix of sustainable performance scores to granular ESG variables

This table provides a correlation matrix on the sustainable performance scores and ESG controversy and output sub-scores on granular sustainable performance information from LSEG ESG. Often negative coefficients are expected when negative externalities are analysed below. In other words, a negative relation between output scores and NO_X & SO_X emissions indicates that higher emissions reduces output scores. To conserve space, exact p-values have been compressed, and only significance 10%, 5%, and 1% levels are denoted with respectively *, **, and ***.

Granular ESG Variables	Sustainable performance	Controversy	Output
CO_2 Emissions	-0.005	0.004	-0.005
Ozon-depleting substances	-0.003	0.007*	-0.004
NO_X & SO_X Emissions	-0.037***	-0.068***	-0.017**
VOC and particulate matter Emissions	0.013***	-0.139***	0.042***
Particulate matter and VOC reduction	0.019***	0.131***	0.045***
NO_X & SO_X Emissions reduction	0.036***	0.169***	0.079***
Renewable energy (ratio)	0.165***	0.206***	0.239***
Water usage / assets	-0.014**	-0.007	-0.009
Water recycled	0.027**	0.015	0.022*
Water pollutant emissions	0.012	-0.017	0.013
Waste / assets	-0.032***	-0.008	-0.022***
Waste recycled	0.004	0.139***	0.026***
Hazardous waste	0.012	0.015*	0.006
Toxic chemicals reduction	0.064***	0.152***	0.037***
Electronic waste reduction	0.062***	0.183***	0.008**
Donations / assets	-0.001	-0.007*	-0.001
Controversies privacy	-0.017***	-0.054***	0.000
Product recall	-0.043***	-0.114***	-0.052***
Controversies consumer complaints	-0.041***	-0.175***	-0.007*
Customer satisfaction	0.055***	-0.108***	0.095***
Controversies wages working conditions	-0.039***	-0.210***	-0.011***
Training hours / employee	0.011*	-0.037***	0.025***
Employee fatalities / assets	-0.023***	-0.076***	-0.033***
Employee satisfaction	0.043***	0.024*	0.049***
Wages/employee	-0.004	0.016	-0.014
Net employment creation / assets	0.002	0.003	-0.001
Employee turnover	-0.012	-0.055***	-0.023***
Strikes	-0.026***	-0.138***	-0.025***
Accidents total	-0.029***	-0.062***	-0.038***
Injury rate	-0.106***	0.076***	-0.134***
Lost time injury rate	-0.065***	-0.038***	-0.073***
Occupational diseases	-0.024*	-0.004	-0.040***
HRC corporate equality index	0.112***	-0.237***	0.150***
Salary gap ratio	-0.009	0.018*	-0.009
Women employees	0.156***	-0.122***	0.196***
Employees with disabilities	0.068***	0.087***	0.057***
Green buildings	-0.001	0.196***	0.066***
Environmental expenditures/ assets	0.052***	0.014***	0.054***
Environmental investment expenditures	0.027***	0.147***	0.030***
Contractor human rights breaches	-0.068***	-0.120***	-0.045***
Contractor accidents	-0.035**	-0.143***	-0.042**
Contractor fatalities	-0.065***	-0.163***	-0.062***
Contractors injury rate (%)	-0.077***	0.109***	-0.097***
Contractor lost time injury (%)	-0.151***	-0.021	-0.141***
Contractor lost time working days	-0.113***	-0.093***	-0.111***
Energy usage	0.007*	0.001	0.004
Renewable energy usage	0.003	0.003	0.003
Climate change commercial risk	-0.097***	-0.371***	-0.075***
Controversies tax fraud	-0.015***	-0.098***	0.004
Controversies business ethics	-0.021***	-0.177***	0.004
Controversy bribery corruption and fraud	-0.070***	-0.403***	0.002
Controversies intellectual property	-0.026***	-0.127***	-0.003
Poison pill	-0.132***	-0.145***	-0.043***
Corporate responsibility awards	0.011***	-0.210***	0.066***
Self-reported environmental fines	-0.003	-0.020***	0.000
Accounting controversies	-0.014***	-0.053***	-0.003
Controversies public health	-0.011***	-0.104***	0.002
Accidental spills	0.029***	-0.104***	0.049***
Environmental controversies	-0.015***	-0.360***	0.053***
Controversies anti-competition	-0.029***	-0.186***	-0.006
Controversies responsible market	-0.014***	-0.146***	0.008**
Obesity risk	0.001	-0.093***	0.003
Controversies product quality	-0.043***	-0.236***	0.003
Controversies customer health	-0.004	-0.093***	0.000

Appendix D ESG ratings, sustainable aspirations, and sustainable performance: robustness checks

This appendix provides further evidence that ESG ratings primarily capture sustainable aspirations rather than sustainable performance across multiple specifications and sub-samples to verify robustness. As a first step, we compute the Pearson correlation between MSCI, FTSE, S&P Trucost, and Sustainalytics ESG ratings, sustainable aspiration and performance scores, and ESG reporting, policy, protocol, target, controversy, and output sub-scores in Table D1. This preliminary analysis shows that ESG ratings positively correlate to sustainable aspirations. In contrast, they display little to no correlation with sustainable performance. This effect can be decomposed into a strong and negative correlation to controversy scores and a partially positive effect on output scores. These findings persist for ESG reporting, policy, protocol, target, controversy, and output sub-scores and strongly indicate that ESG ratings primarily focus on early transition-phase firms with ample sustainable aspirations.

In the second step, we verify that the relation between ESG ratings, sustainable aspirations, and sustainable performance persists when we use more granular measures of sustainable aspirations and performance. We replicate our results of Tables 5 using ESG reporting, policies, protocols, targets, controversies, and output sub-scores. In Table D2, we still observe that ESG ratings positively relate to sustainable aspiration sub-scores but negatively or not related to ESG controversies and performance sub-scores.

As a third step, we verify our results across sub-samples of multiple industries, and geographical locations. In Table D3, we show that the relation between ESG ratings, sustainable aspirations, and sustainable performance persists across industries. Sustainable aspiration scores are positively related across all sectors to all ESG ratings. For sustainable performance scores, we observe a positive effect for FTSE ESG ratings in the generic manufacturing and IT industries and Sustainalytics in the construction, generic manufacturing, IT, and petrochemical

manufacturing industries. Despite some positive relations between sustainable performance and ESG ratings, sustainable aspirations still overshadow performance in terms of economic impact across industries.

Last, Table D4 analyzes the relation between ESG ratings, sustainable aspirations, and sustainable performance in North America, Latin America, Western and Eastern Europe, Western Asia, Eastern Asia, the Middle East and Africa, and Oceania. Even though we lost some power as we cut our sample sevenfold, we observed a general positive effect of sustainable aspiration scores on MSCI, FTSE, S&P, and Sustainalytics ESG ratings and a negative to neutral relation for sustainable performance scores. These analyses jointly rule out that individual characteristics of sustainable performance across industries or continents are uniquely explaining why ESG ratings capture firms early in their sustainable transition phase.

Table D1: Correlation matrix of ESG ratings and sustainable aspiration and performance scores

This table provides a correlation matrix of MSCI, FTSE, S&P, and Sustainalytics ESG ratings, and sustainable performance and aspiration ESG scores as well as ESG reporting, policy, target, protocol, controversy and output sub-scores given Equations (1) and (2). All scores, sub-scores, and ESG ratings are industry-specific and scaled from 0 to 10, for which 0 is inferior and 10 is superior. P-values in parentheses. *, ** and *** respectively denote significance at the 10%, 5% and 1% level.

	MSCI	FTSE	S&P	Sustainalytics	Aspiration	Performance	Reporting	Policy	Target	Protocol	Controversy	Output
MSCI	1.000											
	(0.00)											
FTSE	0.266***	1.000										
	(0.000)											
S&P	0.352***	0.618***	1.000									
	(0.000)	(0.000)										
Sustainalytics	0.341***	0.333***	0.245***	1.000								
	(0.000)	(0.000)	(0.000)									
Aspiration	0.286***	0.425***	0.428***	0.154***	1.000							
	(0.000)	(0.000)	(0.000)	(0.000)								
Performance	-0.011	0.015**	-0.064***	-0.052***	0.045***	1.000						
	(0.355)	(0.020)	(0.000)	(0.000)	(0.000)							
Reporting	0.296***	0.555***	0.529***	0.200***	0.613***	0.061***	1.000					
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)						
Policy	0.311***	0.492***	0.444***	0.223***	0.859***	0.047***	0.614***	1.000				
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)					
Target	0.311***	0.450***	0.501***	0.172***	0.456***	-0.000	0.551***	0.478***	1.000			
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.991)	(0.000)	(0.000)				
Protocol	0.288***	0.407***	0.458***	0.176***	0.807***	-0.006	0.622***	0.667***	0.487***	1.000		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.153)	(0.000)	(0.000)	(0.000)			
Controversy	-0.078***	-0.220***	-0.279***	-0.111***	-0.241***	0.226***	-0.256***	-0.288***	-0.257***	-0.262***	1.000	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
Output	0.011	0.072***	-0.000	-0.002	0.141***	0.845***	0.153***	0.143***	0.073***	0.092***	-0.068***	1.000
	(0.362)	(0.000)	(0.971)	(0.702)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	

Table D2: The impact of sustainable aspiration and performance by part on ESG ratings

This table investigates whether ESG ratings capture sustainable performance using sub-scores. In contrast to Table 5, we here use the controversies and output sub-scores instead of sustainable performance scores and reporting, policies, protocols, and targets sub-scores for sustainable aspiration scores. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

VARIABLES	(1) MSCI	(2) FTSE	(3) S&P	(4) Sustainalytics
Reporting	0.077***	0.319***	0.187***	0.040***
	(0.018)	(0.011)	(0.007)	(0.006)
Policy	0.161***	0.345***	0.112***	0.119***
	(0.036)	(0.018)	(0.012)	(0.010)
Protocol	0.095***	-0.028*	0.111***	-0.003
	(0.027)	(0.016)	(0.010)	(0.009)
Target	0.113***	0.133***	0.147***	0.021***
	(0.015)	(0.009)	(0.006)	(0.005)
Output	-0.046	0.024	-0.070***	-0.022**
	(0.033)	(0.019)	(0.014)	(0.010)
Controversy	0.015	-0.037***	-0.071***	-0.019***
	(0.012)	(0.008)	(0.006)	(0.005)
Observations	7,507	22,797	27,688	28,297
Adjusted R-squared	0.138	0.380	0.385	0.062
Size	NO	NO	NO	NO
Year FE	NO	NO	NO	NO
Firm FE	NO	NO	NO	NO

Table D3: ESG ratings, sustainable aspirations, and performance across industry

This table replicates the most conservative specification in Table 5 across industries. Columns (1) through (10) respectively represent the mining, construction, generic manufacturing, utilities, retail & wholesale, service, healthcare, ICT, food & beverages, and petrochemical manufacturing industries. Firm-clustered standard errors are given in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Panels A to D, respectively, capture ESG ratings of MSCI, FTSE, S&P, and Sustainalytics as dependent variables.

Panel A: MSCI ESG ratings

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Aspiration	1.070***	0.545***	0.696***	0.557***	0.365***	0.411***	0.576**	0.784***	0.761***	0.631***
	(0.198)	(0.103)	(0.106)	(0.147)	(0.092)	(0.070)	(0.216)	(0.080)	(0.105)	(0.166)
Performance	0.111	-0.670***	-0.092	0.137	0.002	-0.014	0.179	0.110	-0.294***	0.023
	(0.113)	(0.223)	(0.082)	(0.196)	(0.089)	(0.074)	(0.202)	(0.089)	(0.096)	(0.161)
Observations	373	266	1,222	804	889	869	160	1,483	478	963
Adjusted R-squared	0.149	0.166	0.101	0.040	0.064	0.063	0.082	0.126	0.230	0.075

Panel B: FTSE ESG ratings

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Aspiration	1.582***	0.712***	1.122***	0.977***	0.838***	0.799***	0.920***	1.115***	1.085***	1.463***
	(0.133)	(0.056)	(0.076)	(0.129)	(0.061)	(0.046)	(0.099)	(0.072)	(0.081)	(0.110)
Performance	-0.000	-0.426***	0.147**	0.228	-0.200***	0.062	-0.113	0.239***	-0.103	0.122
	(0.081)	(0.093)	(0.073)	(0.145)	(0.055)	(0.041)	(0.103)	(0.066)	(0.102)	(0.106)
Observations	1,189	1,137	3,813	2,605	2,636	2,440	553	4,215	1,439	2,770
Adjusted R-squared	0.213	0.253	0.217	0.151	0.206	0.172	0.183	0.214	0.233	0.249

Panel C: S&P ESG ratings

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Aspiration	1.043***	0.576***	0.794***	0.787***	0.520***	0.588***	0.564***	0.890***	0.834***	1.096***
	(0.085)	(0.059)	(0.052)	(0.087)	(0.043)	(0.038)	(0.091)	(0.059)	(0.077)	(0.069)
Performance	-0.224***	-0.344***	-0.122***	-0.174**	-0.122***	0.004	-0.141***	-0.121***	-0.068	-0.188***
	(0.053)	(0.062)	(0.047)	(0.087)	(0.034)	(0.027)	(0.042)	(0.031)	(0.068)	(0.057)
Observations	1,644	1,368	4,852	3,024	2,977	3,115	720	5,226	1,554	3,208
Adjusted R-squared	0.216	0.220	0.199	0.173	0.155	0.187	0.163	0.201	0.242	0.233

Panel D: Sustainalytics ESG ratings

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Aspiration	0.423***	0.106***	0.338***	0.116**	0.118***	0.281***	0.153***	0.241***	0.329***	0.385***
	(0.071)	(0.035)	(0.035)	(0.046)	(0.026)	(0.017)	(0.048)	(0.024)	(0.039)	(0.033)
Performance	-0.027	0.174***	0.107***	-0.018	-0.060**	0.019	-0.102***	0.086***	0.048	0.098**
	(0.057)	(0.045)	(0.036)	(0.060)	(0.028)	(0.014)	(0.038)	(0.023)	(0.049)	(0.042)
Observations	1,830	1,447	4,604	2,530	2,907	4,311	875	5,452	1,286	3,055
Adjusted R-squared	0.057	0.053	0.078	0.007	0.018	0.144	0.053	0.061	0.127	0.125

Table D4: ESG ratings, sustainable aspirations, and performance across regions

This table replicates the most conservative specification in Table 5 across regions. Columns (1) through (7) respectively represent firms in North America, Latin America, Europe, Western Asia, Eastern Asia, the Middle East and Africa, and Oceania. Firm-clustered standard errors are given in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Panels A to D, respectively, capture ESG ratings of MSCI, FTSE, S&P, and Sustainalytics as dependent variables.

Panel A: MSCI ESG ratings

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Aspiration	0.492***	0.556***	0.531***	0.438***	0.473***	0.657***	0.601***
	(0.057)	(0.162)	(0.130)	(0.151)	(0.052)	(0.168)	(0.123)
Performance	-0.009	-0.075	0.070	-0.168	-0.104	-0.253**	-0.149
	(0.057)	(0.200)	(0.070)	(0.141)	(0.074)	(0.113)	(0.093)
Observations	3,015	199	884	288	2,213	281	618
Adjusted R-squared	0.074	0.072	0.044	0.058	0.075	0.102	0.127

Panel B: FTSE ESG ratings

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Aspiration	0.879***	0.721***	0.980***	1.177***	0.690***	0.947***	0.905***
	(0.038)	(0.171)	(0.066)	(0.094)	(0.034)	(0.094)	(0.100)
Performance	0.118***	0.447*	-0.080	-0.271***	-0.033	0.001	-0.134**
	(0.035)	(0.231)	(0.061)	(0.097)	(0.039)	(0.115)	(0.063)
Observations	6,574	531	4,467	1,130	7,850	800	1,383
Adjusted R-squared	0.191	0.106	0.124	0.221	0.150	0.244	0.166

Panel C: S&P ESG ratings

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Aspiration	0.722***	0.677***	0.830***	0.621***	0.644***	0.574***	0.534***
	(0.029)	(0.069)	(0.058)	(0.081)	(0.030)	(0.065)	(0.077)
Performance	-0.030	-0.224*	-0.190***	-0.184***	-0.129***	-0.035	-0.192***
	(0.020)	(0.132)	(0.047)	(0.066)	(0.033)	(0.052)	(0.047)
Observations	8,926	1,009	5,169	1,342	9,026	798	1,359
Adjusted R-squared	0.214	0.192	0.140	0.137	0.163	0.254	0.162

Panel D: Sustainalytics ESG ratings

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Aspiration	0.189***	0.036	0.134***	0.123*	0.101***	0.132***	0.013
	(0.017)	(0.084)	(0.023)	(0.071)	(0.019)	(0.049)	(0.053)
Performance	-0.074***	0.064	-0.029	-0.037	-0.066***	-0.004	-0.057
	(0.016)	(0.132)	(0.022)	(0.050)	(0.021)	(0.070)	(0.053)
Observations	10,742	595	5,865	1,223	7,814	751	1,208
Adjusted R-squared	0.038	-0.001	0.014	0.008	0.013	0.023	0.001

Appendix E CO_2 data smoothing

Aswani et al. (2024) show that Trucost CO_2 data fits some missing emissions data using industry and size. In other words, not all CO_2 data is retrieved from firms or government records but instead estimated using a statistical model. One might argue that this estimation could potentially affect our results as it effectively smooths out variation in sustainable performance. This Appendix provides several arguments and robustness analysis to show that this does not affect our findings.

First, as presented above, our non-parametric rank-ordering method compares firms' sustainable performance information in well-equipped ways to deal with missing information and data imputation. The technique compares firms' sustainable performance in relative terms by industry and scales outcome data by size. Therefore, the imputed CO_2 data will effectively be interpreted as constant and will not substantively affect overall rankings.

Second, we apply size controls and firm fixed effects in most specifications. Imputed CO_2 data might affect the dependent variable in some regressions with ESG ratings or sustainable performance. However, by controlling for firm fixed effects and size, we roughly remove the influence of this data imputation, which solely differs in these dimensions when imputed.

Last, to provide the reader with conclusive evidence that data imputation does not affect our results by replicating our analyses without it. Tables 4, 5, and 7 could potentially be subject to CO_2 data imputation. More broadly speaking, firms with imputed CO_2 data might also be at risk of having other data imputed due to lower reporting quality or purposeful removal of certain information. For this reason, we remove all observations for which LSEG indicates CO_2 data is imputed. We find qualitatively similar results throughout these analyses in the three Tables depicted below. For these reasons, we do not think CO_2 data imputation plays a major role in our results.

Table E1: CO_2 screened: ESG ratings, sustainable aspirations, and sustainable performance

This table regresses firms' raw sustainable aspiration and performance information for emissions, water use, human rights, and employee safety on their MSCI, FTSE, S&P, and Sustainalytics ESG rating. Columns (1) through (4) use MSCI, FTSE, S&P, and Sustainalytics ratings as dependent variables, respectively. CO_2 emission policy, CO_2 emission targets, Water efficiency targets, Human rights policy, and Employee health safety team, are equal to 1 if firms adopt these issues or 0 when they do not. We scale CO_2 emissions, Water use, Human rights controversies, and Total accidents by total assets in millions and take the logarithm of one plus each variable. Firm-clustered standard errors are given in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively

VARIABLES	(1) MSCI	(2) FTSE	(3) S&P	(4) Sustainalytics
CO_2 emission policy	0.389**	0.248***	0.085	0.091***
	(0.155)	(0.078)	(0.057)	(0.033)
CO_2 emission targets	0.355***	0.218***	0.313***	0.086***
	(0.128)	(0.054)	(0.040)	(0.022)
CO_2 emissions	-0.018	0.003	-0.007	0.005
	(0.028)	(0.012)	(0.009)	(0.005)
Water efficiency targets	0.199	0.340***	0.258***	0.091***
	(0.139)	(0.061)	(0.046)	(0.026)
Water use	-0.020	-0.006	-0.037***	-0.006
	(0.021)	(0.012)	(0.010)	(0.004)
Human rights policy	0.412***	0.098	0.138***	0.072***
	(0.146)	(0.062)	(0.042)	(0.023)
Human rights controversies	0.250	0.032	0.131	-0.185**
	(0.378)	(0.163)	(0.176)	(0.087)
Employee health safety team	0.073	0.186***	0.119***	-0.009
	(0.138)	(0.055)	(0.039)	(0.021)
Total accidents	-0.055	0.028*	0.002	0.008
	(0.040)	(0.016)	(0.011)	(0.005)
Observations	3,588	18,056	20,360	17,823
Adjusted R-squared	0.669	0.771	0.780	0.886
Size	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES

Table E2: CO_2 screened: ESG ratings: A measure of sustainable aspirations or performance?

This table regresses the sustainable aspiration and performance scores of firms on their MSCI, FTSE, S&P, and Sustainalytics ESG ratings. Columns (1) to (3), (4) to (6), (7) to (9), and (10) to (12) use MSCI, FTSE, S&P, and Sustainalytics ratings as dependent variables, respectively. Firm-clustered standard errors are given in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

	MSCI			FTSE			S&P			Sustainalytics		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Aspirations	0.570***	0.686***	0.226***	1.041***	0.884***	0.241***	0.817***	0.698***	0.191***	0.131***	0.224***	0.051***
	(0.057)	(0.066)	(0.067)	(0.038)	(0.041)	(0.022)	(0.030)	(0.031)	(0.017)	(0.019)	(0.021)	(0.008)
Performance	-0.029	-0.048	0.027	0.034	-0.068***	-0.027*	-0.069***	-0.039**	-0.007	-0.086***	0.011	-0.002
	(0.051)	(0.047)	(0.045)	(0.030)	(0.025)	(0.016)	(0.023)	(0.017)	(0.012)	(0.015)	(0.013)	(0.006)
Observations	5,294	5,294	3,588	18,274	18,274	18,056	20,904	20,904	20,360	18,143	18,143	17,823
Adjusted R-squared	0.041	0.209	0.662	0.113	0.476	0.769	0.114	0.436	0.777	0.012	0.332	0.885
Size	NO	YES	YES	NO	YES	YES	NO	YES	YES	NO	YES	YES
Industry FE	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES	NO
Country FE	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES	NO
Year FE	NO	YES	YES	NO	YES	YES	NO	YES	YES	NO	YES	YES
Firm FE	NO	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES

Table E3: CO_2 screened: Sustainable aspirations and subsequent sustainable performance

This table regresses the past 15 years sustainable aspiration scores on sustainable performance scores, removing observations for which CO_2 is estimated. Each regression coefficient represents the parameter estimate of individual regressions of lagged aspiration scores on performance scores. Observations and adjusted R^2 represent the average over the 15 regressions in each Column. The dependent and independent variables for Column (1) are the sustainable performance and aspiration scores as before. The dependent and independent variables for the later Columns capture the sustainable performance and aspiration scores specific to 14 SASB categories. These capture green investments (2), greenhouse gas emissions (3), materials source management (4), supply chain management (5), water use (6), business ethics (7), customer welfare (8), legal and regulatory concerns (9), labor practices (10), waste management (11), privacy (12), selling practices (13), employee health safety (14), employee management (15). Firm-clustered standard errors are given in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

VARIABLES	All (1)	Green investments (2)	Greenhouse gas emissions (3)	Materials source management (4)	Supply chain management (5)	Water use (6)
$Aspirations_{i,t-1}$	0.06***	0.19***	0.02***	0.07***	-0.14***	0.06***
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
$Aspirations_{i,t-2}$	0.02**	0.13***	0.02***	0.06***	-0.16***	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-3}$	0.01	0.08***	0.02***	0.06***	-0.10***	0.02***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-4}$	0.00	0.03***	0.02***	0.05***	-0.05***	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-5}$	-0.01	-0.00	0.01*	0.03***	-0.02	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-6}$	-0.01	-0.02	0.01**	0.02***	-0.00	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-7}$	-0.02*	-0.03*	0.01*	0.01	0.03**	-0.02***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-8}$	-0.02*	-0.02	-0.01	-0.00	0.04***	-0.03***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-9}$	-0.02	-0.02	-0.00	-0.00	0.06***	-0.02***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-10}$	0.00	-0.00	0.01	0.01	0.05***	-0.01
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)
$Aspirations_{i,t-11}$	0.01	-0.01	0.03***	0.01	0.03	-0.00
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)
$Aspirations_{i,t-12}$	0.00	-0.01	-0.02*	0.01	0.03	-0.00
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)
$Aspirations_{i,t-13}$	-0.00	-0.03	-0.02**	0.01	0.04	0.00
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)
$Aspirations_{i,t-14}$	-0.01	-0.03	-0.02	0.02	-0.02	-0.00
	(0.01)	(0.02)	(0.01)	(0.01)	(0.03)	(0.01)
$Aspirations_{i,t-15}$	0.01	-0.02	-0.02*	0.03**	0.00	-0.02*
	(0.02)	(0.02)	(0.01)	(0.01)	(0.04)	(0.01)
Observations	13,235	13,235	13,235	13,235	13,235	13,235
Adjusted R^2	0.666	0.662	0.806	0.564	0.670	0.736
Size	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES

Table 3 – continued

VARIABLES	Business ethics (7)	Customer welfare (8)	Legal and regulatory concerns (9)	Labor practices (10)	Waste management (11)	Privacy (12)	Selling practices (13)	Employee health safety (14)	Employee management (15)
$Aspirations_{i,t-1}$	-0.02**	0.01*	-0.01**	0.00	-0.00	0.00	0.01*	-0.01***	0.00
	(0.01)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Aspirations_{i,t-2}$	-0.03***	0.00	-0.01*	-0.02***	0.00	-0.01**	0.00	-0.02***	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
$Aspirations_{i,t-3}$	-0.03**	-0.00	-0.00	-0.03***	0.01*	-0.01***	0.01	-0.01***	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
$Aspirations_{i,t-4}$	-0.01	0.00	0.01	-0.02**	0.01	-0.01**	0.01	-0.01***	-0.00
	(0.02)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
$Aspirations_{i,t-5}$	-0.04**	-0.00	0.01	-0.02	0.00	-0.01**	0.01	-0.01**	-0.01**
	(0.02)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
$Aspirations_{i,t-6}$	-0.05***	0.00	-0.00	-0.02	0.00	-0.01**	0.02**	-0.01**	-0.00
	(0.02)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
$Aspirations_{i,t-7}$	-0.04**	0.01	-0.01	-0.02	-0.01	-0.02**	-0.00	-0.01***	-0.00
	(0.02)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-8}$	-0.05**	0.02	-0.01	-0.02*	-0.00	-0.02**	0.00	-0.01	0.00
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-9}$	-0.05**	-0.00	-0.00	-0.02*	-0.00	-0.01	-0.02**	-0.01**	0.01
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-10}$	-0.02	-0.02	-0.03*	0.00	-0.00	0.01	-0.03***	0.00	0.00
	(0.03)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-11}$	-0.02	0.01	-0.03*	0.01	0.00	0.00	-0.03***	0.02**	0.00
	(0.03)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-12}$	0.02	0.00	-0.02	0.01	-0.00	0.01	-0.05***	0.02**	-0.01
	(0.03)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
$Aspirations_{i,t-13}$	-0.00	0.01	-0.01	-0.01	0.00	-0.00	0.00	0.00	0.00
	(0.04)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)
$Aspirations_{i,t-14}$	0.04	0.02	-0.07***	-0.01	-0.00	-0.01	0.00	-0.01	-0.00
	(0.04)	(0.03)	(0.02)	(0.02)	(0.01)	(0.03)	(0.02)	(0.01)	(0.02)
$Aspirations_{i,t-15}$	0.02	0.02	-0.03	0.03	0.00	0.02	0.02	0.01	-0.04**
	(0.05)	(0.04)	(0.03)	(0.02)	(0.01)	(0.03)	(0.02)	(0.01)	(0.02)
Observations	13,235	13,235	13,235	13,235	13,235	13,235	13,235	13,235	13,235
Adjusted R^2	0.350	0.406	0.614	0.260	0.867	0.157	0.463	0.603	0.505
Size	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Appendix F Cost of capital computation

In this appendix, we provide further details on our cost of capital computation. We also analyze the impact of Gebhardt et al. (2001), Hou et al. (2012), and Chattopadhyay et al. (2022) cost of equity and interest expense and bond yield cost of debt estimates on ESG ratings.

The Gebhardt et al. (2001) model is an implied cost of capital model. Implied cost of capital models generally discount the residual income of firms to create an implied cost of capital measure given current stock prices. The scope of implied cost of capital models is often limited by the coverage of I/B/E/S data that is used to predict future earnings. To replicate the model of Gebhardt et al. (2001), we also collect I/B/E/S one and two years ahead earnings per share (EPS) estimates in addition to stock price information from CRSP, the book value of equity, earnings, dividend, and long-term debt from Compustat US. Since our sample is international and Gebhardt et al. (2001) focuses solely on US firms, we append accounting and stock price information from Compustat Global to our dataset. We estimate the Gebhardt et al. (2001) model using the following formula:

$$P_t = B_t + \frac{FROE_{t+1} - r_e}{(1+r_e)} B_t + \frac{FROE_{t+2} - r_e}{(1+r_e)^2} B_{t+1} + \sum_{i=3}^{11} \frac{FROE_{t+i} - r_e}{(1+r_e)^i} B_{t+i-1} + \frac{FROE_{t+12} - r_e}{r_e(1+r_e)^{11}} B_{t+11} \tag{3}$$

In Equation 3, P_t represents the price of an individual stock of a specific firm extracted from CRSP and Compustat Global. B_t denotes the book value per share from the most recent financial statement divided by the number of shares extracted from I/B/E/S in June. Where information is missing, we use the book value per share in IBES, or information on the number of shares in CRSP, Compustat US, or Compustat Global.

Gebhardt et al. (2001) define $FROE_t + i$ as the forecasted return on assets in period $t+1$. For the first three years, this is estimated using $\frac{FEPS_{t+i}}{B_{t+i-1}}$, for which $FEPS_{t+i}$ represents the book earnings for t+i years in advance and B_{t+i-1} the book value per share in year $t-i-1$. For years

4 to 11, the FROE is linearly interpolated from its value in year three to the industry-specific ROE mean estimated using book values on our complete Compustat US and Compustat Global sample. These industry means are corrected for taxes and estimated using a five-year rolling window on profitable firms.

The parameter B_{t+i} equates $B_{t+i-1} + FEPS_{t+i} * (1-k)$, with k denoting the dividend payout ratio. In other words, the current book value of equity per share is the sum of the previous period's book value per share and the current period's earnings minus dividends. k is computed using the forecasted dividend per share where data is available in CRSP, Compustat US, Compustat Global, or by setting the dividend payout rate to 6% of total assets when earnings are negative in respective order.

We execute this model in an iterative manner for which we first estimate the three years of B_{t+1}, B_{t+2}, $FROE_{t+1}$, $FROE_{t+2}$, and $FROE_{t+3}$ using the given data. Subsequently, we compute B_{t+3} by interpolating the data provided in $FROE_{t+3}$ and the industry mean, which we in turn need to compute $FROE_{t+4}$. This process continues until we reach B_{t+11} and $FROE_{t+12}$.

Once we have all required parameters, we compute the Gebhardt et al. (2001) cost of equity estimate, r_e, by plotting interest rates from 1 basis point to 30000 basis points iteratively. For each firm and cost of equity, we compute the difference in estimated stock price and realized stock price. We observe global optima for 99% of our firm-year observations before our 30% cost of equity boundary.

As the second cost of equity estimate, we replicate the fitted implied cost of capital model of Hou et al. (2012). The Hou et al. (2012) cost of equity estimates repurposes the initial cost of equity models by adjusting the earnings estimates with accounting information to expand the sample beyond an I/B/E/S universe of firms. We follow Lee et al. (2021) and append the Gebhardt et al. (2001) model with augmented earnings estimates. To compute these earnings, we collect income before extraordinary items, total assets, shareholders equity, dividend, and cash flow from operations information from Compustat US and Compustat Global. We employ

this data in the following regression equation:

$$E_{i,t+\tau} = \alpha_0 + \alpha_1 A_{i,t} + \alpha_2 D_{i,t} + \alpha_3 DD_{i,t} + \alpha_4 E_{i,t} + \alpha_5 NegE_{i,t} + \alpha_6 AC_{i,t} + \varepsilon_{i,t+\tau} \quad (4)$$

In Equation 5, $E_{i,t+\tau}$ denotes the income before extraordinary items of firm i at time t τ years ahead. $A_{i,t}$ denotes total assets, $D_{i,t}$ total dividend, $DD_{i,t}$ a dividend dummy, $NegE_{i,t}4$ a negative earnings dummy, and $AC_{i,t}$ accruals. This model is estimated using a pooled cross-sectional regression using a rolling window of up to ten years. Each α coefficient is saved and used to compute the fitted earnings up to three years in the future using firm-level accounting information. Subsequently, we use this adjusted earnings measure in the Gebhardt et al. (2001) model to compute the Hou et al. (2012) cost of equity.

We use Chattopadhyay et al. (2022) to compute our third cost of equity estimate. Chattopadhyay et al. (2022) solely uses stock price and accounting information to estimate the cost of equity. This cost of equity measure is applicable for our international sample as it does not rely on I/B/E/S data and can, therefore, be calculated for a larger universe of international firms. To compute the Chattopadhyay et al. (2022) model, we collect daily and monthly market capitalization and total return index information from CRSP and Compustat Global, book value of equity, return on equity, and country of denomination from Compustat US and Compustat Global. As with all our cost of equity estimates, returns and book values are transmuted to USD. We use this information in the following regression model:

$$R_{i,t+1} = \beta_{i,1} + \beta_{i,2} bm_{i,t} + \beta_{i,3} roe_{i,t} + \beta_{i,4} var_{i,t} + \sum_{j=1}^{12} \alpha_{i,j} r_{i,t-j+1} + \zeta_{i,t+1} \quad (5)$$

In Equation 5, $R_{i,t+1}$ represents the one-month-ahead realized returns, $bm_{i,t}$ the book to market ratio, $roe_{i,t}$ return on equity, $var_{i,t}$ the firm-specific squared daily log returns in month t, and $r_{i,t-j+1}$ the j month lagged realized total returns. This regression model is estimated for

each country using a 10-year rolling window where available. The coefficients are saved to compute fitted cost of equity values by multiplying the country-specific coefficients with the firm-level data.

We trim each cost of equity and cost of debt measure at 0% and 25% to remove outliers from the data. Subsequently, we winzorize the cost of debt, equity, and capital measures at the 1% and 99% levels. In Table F1, we display the average cost of equities and costs of debt across each year in our sample. As anticipated, cost of equity is on average higher than cost of debt, with an average weighted average cost of capital, cost of equity, and cost of debt of 4.87%, 8.03%, and 2.32%. Furthermore, cost of equity estimates are significantly more volatile than cost of debt estimates. We find that (fitted) cost of capital models are more stable over time than accounting-based and factor-based models. This is in line with Lee et al. (2021).

In Table F2, we regress the individual cost of equity and debt estimates on the average MSCI, FTSE, S&P, and Sustainalytics ESG ratings of firms using firm fixed effects. We find that cost of equity and debt generally negatively relate to ESG ratings (with Chattopadhyay et al. (2022) cost of equity estimates as exception). Not all estimates are statistically significant as they carry relatively high variance (hence our aggregation of multiple measures). Given the above, we argue that our choice of cost of equity and cost of debt estimates is not unreasonable in estimating the impact of portfolio tilting based on ESG ratings.

Table F1: Cost of capital summary statistics by year

This table provides the mean of Gebhardt et al. (2001), Hou et al. (2012), and Chattopadhyay et al. (2022) cost of equity estimates, interest expense and bond yield spread debt estimates, and aggregate measure based on these estimates.

Year	Wacc	Cost of Equity	Gebhardt et al. (2001)	Hou et al. (2012)	Chattopadhyay et al. (2022)	Cost of Debt	Interest Expense	Yield Spread
2003	4.12	6.15	5.56	6.03	13.29	2.94	2.37	4.90
2004	4.42	7.37	5.93	7.10	13.62	2.48	2.03	4.89
2005	4.77	8.30	4.63	5.69	14.55	2.33	1.83	5.37
2006	4.40	7.09	5.83	5.42	14.36	2.46	1.88	6.11
2007	4.82	7.85	8.04	9.54	13.54	2.55	2.00	6.11
2008	4.90	7.86	6.78	5.98	11.04	2.75	2.14	7.20
2009	5.07	8.56	6.81	6.57	14.24	2.60	2.12	6.62
2010	4.60	7.47	6.89	6.26	13.87	2.28	2.02	4.79
2011	4.54	7.19	6.67	6.11	12.55	2.21	1.97	4.50
2012	4.59	7.45	8.13	6.29	15.18	2.19	2.00	3.91
2013	4.77	7.90	6.82	5.99	14.26	2.14	1.97	3.83
2014	4.46	7.25	3.22	3.82	12.62	2.12	1.96	3.77
2015	4.85	8.08	5.43	5.92	12.48	2.18	1.98	4.33
2016	4.80	7.84	5.85	6.13	13.04	2.20	2.03	4.19
2017	5.10	8.57	5.27	5.87	12.68	2.17	2.06	3.88
2018	4.88	7.82	6.30	5.92	10.61	2.28	2.15	4.54
2019	4.63	7.21	5.09	6.15	11.27	2.30	2.22	4.18
2020	4.83	7.95	5.82	5.62	12.87	2.17	2.12	3.84
2021	5.40	9.35	6.14	6.41	11.18	1.91	1.91	2.88
2022	5.07	7.55	6.11	6.71	12.37	2.14	2.06	3.60
Average	4.87	7.93	6.07	6.18	12.98	2.32	2.04	4.76

Table F2: Cost of capital and ESG ratings robustness

This model shows the relationship between ESG ratings and cost of capital for individual and aggregated cost of equity, debt, and capital measures. Firm-clustered standard errors are given in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Gebhardt et al. (2001)	Hou et al. (2012)	Chattopadhyay et al. (2022)	Interest	Yield	Equity	Debt	Capital
ESG Rating	-0.022**	-0.037***	-0.017	-0.016***	-0.026	-0.016	-0.016**	-0.028***
	(0.010)	(0.011)	(0.033)	(0.006)	(0.016)	(0.015)	(0.006)	(0.008)
Observations	41,751	30,967	39,288	54,524	8,855	57,612	55,764	52,575
Adjusted R^2	0.001	0.001	0.00	0.001	0.001	0.005	0.005	0.002
Size	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES